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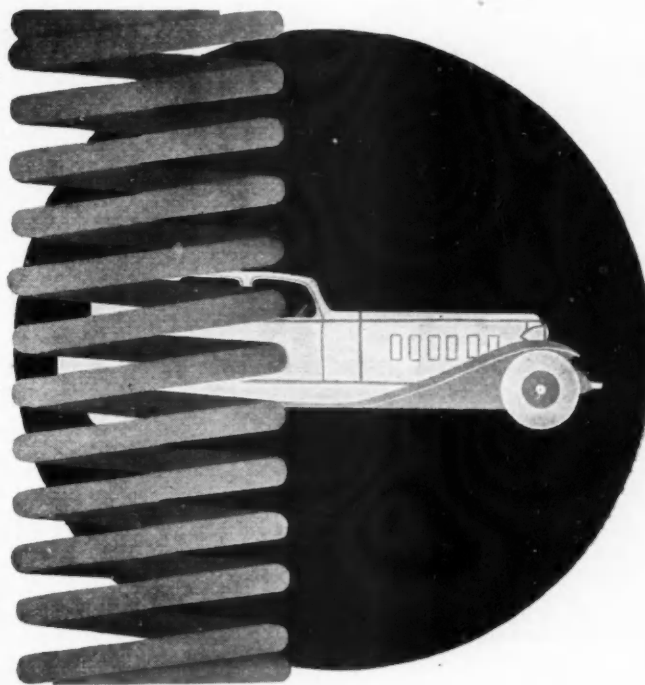
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June 25, 1932

Automotive Industries

"Doughnut" Nightmares Haunt Engineers at Summer Session

DRIVEN by the pressure of sales and advertising departments, engineers are being forced toward quick adoption of so-called super-balloon or doughnut tires before these units have been thoroughly tested in service and before time has been allowed for properly revising other phases of design which will be thrown out of balance by their introduction.

This was one of the outstanding facts developed at the annual Summer Meeting of the Society of Automotive Engineers held at White Sulphur Springs, West Va., June 12-17.

Besides public and informal discussion of the pressing problems being generated by the threat of immediate injection of super-balloons into passenger car design programs, the sessions brought to light the extent of progress which has been made in brake drum metallurgy and brake lining problems, made clear general apprehension about adverse effects on truck design which may accrue from legislative trends, and made possible presentation of a wealth of detailed data concerning recent parts designs and research investigations.

Under the head of new parts designs might be included the descriptive papers on piston ring progress, vacuum and air type power brake for trucks and trailers, free-wheeling devices and controls and several others. Papers designed chiefly as presentations of the results of research or experimental work dealt with such topics as brake drums and linings, body die developments, ignition qualities of Diesel fuels, measurement of vapor pressures of automotive Diesel fuels, journal bearing characteristics in the region of thin



SUMMER MEETING, 1932

by Norman G. Shidle
and Leslie Peat

film lubrication, temperature's effect on gum in gasoline, and the effect of humidity on engine performance.

But next to the doughnut tire discussion, which assumed prime importance because of its wide commercial and engineering significance, the two most vital matters to get attention were those of legislation as related to practical design problems in the commercial vehicle field, and predictions of what we may expect in the passenger car of the future.

Primary stimulation of this latter train of thought was given at the very start of the meeting when William B. Stout, in a talk filled with good-natured satire and salted with stimulating

irony, chided the engineers on their tendency to think in mental ruts. Speaking of "What Motor Cars Should Be," this veteran technician voiced the opinion that most new ideas come into any given industry from outsiders who are not sufficiently case-hardened with the traditions of the particular industry to make them impervious to entirely new approaches to old problems.

He punched holes in some of the current ideas about streamlined bodies, pointing out that little advantage is to be gained unless the streamlining is applied to the sides of the vehicle as well as to the back and front. He ridiculed the traditional design which sticks to a separate body and frame, said that much more of the "acreage" covered by the automobile could easily be put to practical use and urged strongly a review of elementary fundamentals of design from an entirely fresh point of view.

"In natural streamlining," Mr. Stout stated, "the front shape does not amount to much, but the shape

Gadgets vs. Brains

"... adding gadgets to cure inherent faults in design is a fallacy sponsored by so-called big executives in motor car plants.... there's no more reason for a four-passenger car weighing three tons than an eight-passenger Pullman coach weighing 90 tons...."

William B. Stout
Vice-President, S.A.E.

of the rear is very important. One cannot streamline an automobile like an airplane or motor boat. With an airplane, the air always comes directly from the front, never from the side.

"The average man's conception of a streamlined car involves the idea of straight sides, the car itself shaped like a wind curve. This means that in a quartering side wind there would be two or three times the tendency for wind to blow the car off the road as would be the case with the old type of automobile." Then he continued:

"There is no more reason for a motor car for four people weighing three tons than there is for a Pullman coach for eight persons weighing 90 tons.... The motor car firm which is not connected with the aeronautical development today is of necessity sadly behind on what aviation can give to the motor car business.

"We sell a man a motor car of 56 in. tread and say 135 in. wheelbase. If it is a real swanky car, half of the front is taken up with powerplant and hood, leaving to the passengers only the rear half of the car—fore and aft. Sideways, we then take of the width of the running boards, 24 or 30 in., leaving a scant seating room for three abreast in summer clothes. Since these seats are over the axle, you may expect to be thrown; also, the wheel housing interferes with the side of the cushion so far as comfort is concerned.

Great Waste Spaces

"Back of the rear seat, we waste more space with more accessories and gadgets, until, when we get through, less than one-fourth the car plan area is delivered to the customer, when he actually has paid for the total road area and the weight of the car which that road area represents. Waste space and lack of forethought are robbing the owner of 50 per cent of the possible luxury he could get on the same wheelbase if a little thought were spent in arranging it for him.

"Our entire recent work seems to have been to find a lot of gadgets to add to a motor car to cure its blatant faults, rather than to take the faults out of our present cars so that they do not need the gadgets. However, I do not blame the engineer. The so-called big executive is most to blame." Later on in the meeting H. G. Winter, Briggs Mfg. Co., struck at the idea that streamlining would mean the standardization of appearance, pointing out that considerable standardization already exists and stating that "a relatively efficient aerodynamical form may be found without digressing entirely from the accepted shape and contour of the present-day motor car."

Greater contact with the ideas of the young people of the country as a basis for development of future car designs was offered by F. S. Spring, Hudson Motor Car Co., as one way to insure the proper course for engineering thought. "We must change constantly," he said, "but we must not make too radical changes, either

in our organizations for design or for manufacture or distribution. Any system is weakened by an attempt to assimilate too much foreign matter too suddenly.... If we are going somewhere, if we are to go anywhere, our future is to be all new. Our future is with youth."

The growing concern with which engineers are viewing current legislative and taxation trends cropped out here and there throughout the session. Following an outline of present and future trailer applications by James W. Cottrell, technical editor, *Commercial Car Journal*, several speakers pointed out that the whole future of economical truck and trailer use may be grossly distorted by unfair and unfavorable legislation and that the engineer from now on must take an active interest in the doings of state legislatures, if he is to have the opportunity to develop truck and bus design along the most logical and economic lines.

New Laws Are New Perils

F. C. Horner, General Motors Corp., gave warning of the many perils in sight. "The time was never so opportune," he said, "for railroads to force through legislation against motor transportation. Forty-two legislatures meet next year. And the railroads have the automobiling public with them. We are headed for a lot of trouble."

He, with several others, pointed out that the recent decision of the U. S. Supreme Court in the Texas case upholding the right of a state to legislate against motor transportation for the benefit of the railroads opened up the way for similar action by other states.

"Expansion of use of heavy duty high speed units is ended," he predicted, commenting on Mr. Cottrell's observation that trailer operating speeds had reached a figure which was bringing about the use of streamlined bodies. Part of the blame for adverse legislation belongs to truck operators, in Mr. Horner's opinion, because of abuse in truck and trailer use.

Two representatives of large fleet organizations, J. F. Winchester, Standard Oil Co. of N. J., and Leo Huff of Pure Oil Co., observed that snaking of trailers, making it almost impossible for passenger cars to pass, aroused resentment in the minds of the driving public resulting in unfavorable opinion in legislative halls. Two other fleet men, A. F. Coleman, Standard Oil Co. of N. Y., and F. K. Glynn, American Telephone & Telegraph Co., also discussed legislation, Mr. Coleman urging procurement of legislation to permit operation of tractor and trailer trains up to 65 ft. overall length, and Mr. Glynn telling of the work of the S. A. E. code committee, in compiling information on which a code could be based.

Hits Railroad Propaganda

Closing a lively discussion of power brakes for trucks and trailers at the Tuesday session, Martin L. Pulcher, president of Federal Motor Truck Co., denounced the railroad legislative program against all truck and bus operators.

"Now, with 25 per cent of the new Federal revenue bill charged directly against users of cars and trucks," he said, "and in the face of excessive levies against motor vehicles by every state in the Union, the railroads are pressing their restrictive legislative measures in almost every state.

"Next year 42 of the 48 state legislatures will meet. All of them will consider new laws against the industry.

"Everyone interested in the industry will do well

to interest themselves in this serious matter, and stand ready to aid the National Automobile Chamber of Commerce in every possible way.

"It is true that the railroad business is poor—but all business is poor these days. The motor vehicle industry gives the railroads annually far more freight than is being taken from them by our industry.

"Now, to carry on this fight, the industry is underwriting a nation-wide campaign to bring into the fight against higher taxes and more restrictions operators and users of motor vehicles."

Bearing definitely on the promotion of constructive legislation was the agreement by members of the S. A. E. Motor Vehicle Code Committee on what constitutes proper length, height, and weight restrictions. To insure complete agreement, the conclusions reached by the committee meeting at White Sulphur will be sent to the entire membership of the committee for a mail ballot. If approved, the S. A. E. recommendations will be submitted to the Motor Vehicle Conference Committee of which the S. A. E. has lately become a member.

Another aspect of indirect relation between the Society and possible legislative activity has been through the road impact tests. The Highway Research subcommittee at its White Sulphur meeting approved the results of the latest set of impact tests.



Redesigning is Required To Use Super-Balloons

"... unburied ghost returns to haunt engineers ..."

FUTURE DEVELOPMENTS

BUT for immediate and dominant interest from both an engineering and commercial standpoint, nothing developed at the entire meeting comparable to the discussion about doughnut tires. Officially, the subject came into the program by way of Dr. B. J. Lemon's paper judiciously entitled, "Judging Super-Balloon Tires." Throughout his thorough paper, Dr. Lemon spoke frankly and clearly, concluding with this very significant paragraph: "If super-balloons are judged solely on the basis of the advantages and disadvantages that accrue from their use on 1932 cars, they stand condemned today by an almost unanimous vote of the automobile engineering fraternity.

"Their advantages, generally acknowledged, are better traction, questionable appearance appeal and questionable ride appeal, all powerful factors, however, influencing a transportation-buying public.

"Their disadvantages include an immensely complicated and exceedingly expensive car, wheel and tire-development program thrust upon these and allied industries at a time when economic survival hangs in the balance.

"If the super-balloon is just another sensational gadget to attach to 1932 cars to attract a relatively small percentage of additional sales, it should be and will be shown the door quickly. But if, as I believe, larger-section tires for smaller wheels are still part of the evolutionary tire movement that has been under way since buggy days, then these new tires, whether double or triple or quadruple oversizes, must be reckoned with seriously in future automobile design."

Throughout the discussion there was marked opposition from most of the engineers to the new super-balloon development, thus bearing out Dr. Lemon's statement in this regard. W. S. James, Studebaker,

History Repeats

"... engineering reception of super-balloons is just as chilly as it was 10 years ago. There's nothing new about these big tires except greater degree of ballooning. Its advantages and disadvantages were listed 10 in 1923 ..."

B. J. Lemon

Field Engineer, U. S. Rubber Co.

claimed that tests made by his company showed no improvement in riding comfort when the new tires were applied to cars which already rode well; that only slight improvement was noted on cars which were hard riding. Tore Franzen of Chrysler, in a letter read at the session, said that his organization was now able to produce acceptable riding qualities with the big tires.

The opinion of these and several other car engineers, in other words, seemed to be that by dint of considerable work their cars could be made to perform properly from a comfort standpoint with the new tires, but that no great advantage in comfort accrued from them.

If the tires are to be adopted, on the other hand, a vast amount of very difficult engineering work must be done, it was agreed, in connection with steering, redesign of fenders, wheels and other parts of the car. Several speakers who professed to have been experimenting with these tires for some time spoke unfavorably of their performance, claiming that their application resulted in definitely harder steering at all speeds, tire squeel in turning curves, extremely hard steering in parking and instability under certain conditions at high speed. It was quite evident that most of the car engineers see nothing in the possible advantages of the super-balloons, to compensate for what they consider the very definite disadvantages which seem to come along with them.

Despite this fact, it was pretty generally agreed that these new tires were going to be forced on the cars by sales and advertising pressure. J. C. Tuttle, development engineer, Goodyear, claimed for the new tires definite advantages from the standpoint of riding comfort and appearance, stating his belief that there is a definite field for these new tires on the smaller and lighter cars. He seemed to agree with Mr. Lemon that the change should be to three or four rather than to eight or nine oversizes from the present tires.

Wheels Smaller, But Heavier

Representative of a wheel company stated that, despite the decreased wheel size, the weight of wheels must be increased 30 per cent for the new tires.

Dr. Lemon presented a strikingly clear picture of the super-balloon situation from an engineering standpoint. He said in part:

"Tire history of 1923 seems almost certain to repeat itself in 1933, for super-balloon tires confront us as a stern reality. The full-balloon tire, an unlaidd ghost which a decade ago brought to a focus perhaps our greatest variety of automobile problems, has returned to haunt the engineers of the industry.

"The eye appeal of big tires tends to make us forget that wholly acceptable riding comfort can be attained only by an engineering correlation of a pillow looking tire with a number of other interrelated automobile parts that are equally important from the viewpoints of riding and operation. The result is that today car

Bouncing Problems

Shimmy, tramp, wheel kick, acute steering troubles, springing, snubbing, brake system redesigning, weight distribution, seat-cushion spring deflection will now force their attention upon the engineer with the advent of the super-balloon

engineers are confronted in a correspondingly magnified degree with the perennial problems of shimmy, tramp and wheel kick; of revised steering, springing, snubbing, weight distribution and seat-cushion spring rates and deflections, which problems they must accept and try to reduce more nearly to a final solution, because the customer and the sales department will not forsake the thought of the improved ride they anticipate from the super-balloon.

"The engineering reception of the super-balloon tire is just as chilly as it was 10 years ago. This chilliness may be of shorter duration because of hotter competition. The vision of duty before our eyes in 1932 is to do our customarily thorough job in double-quick time; and the quicker and harder we wrestle with the problem, the stronger will be our nerve and the sharper our skill in completing the work.

"Nothing about the super-balloon tire is particularly new, except the greater degree of ballooning. Its advantages and disadvantages were listed in 1923. Until order is restored out of the present chaos, no clear definition of a super-balloon tire is possible.

"Fortunately for our super-balloon tire set-up, car engineers have kept extreme oversizing quite well in check. Graham-Paige chose the 7.50 in., a triple oversize, and the DeSoto and Rockne are offered with quadruple oversizes.

"Merely selecting a certain oversize by no means gives a large-section tire a super-ballooning ride-effect unless low enough pressures are used to compensate in cushioning for the increased tire-size.

Loads, Inflation and Mileage

"It is too early in the development of the super-balloon tire to claim that tire-tread life will exceed that of the present standard tire. Increase in area of 50 to 65 per cent for the super-balloon leads one to expect longer tread wear. Rate of tread wear depends largely upon the amount of scrubbing action which the tread undergoes, and the rate of this action increases with increased area when caused by lower inflation pressures or higher loads.

"Tests run with inflations that allow a deflection of 22 per cent show an abnormal rate of tread wear.

"Again because of increased deflection, the increase in inflation due to tire heating is rather more rapid in super-balloons up to a temperature at which the radiation of heat from the larger exposed tire surface establishes temperature and pressure equilibrium. An extreme of 9-lb. increase has been noted on a six-ply 7.50 standard balloon tire running at high speed on a hot day. Up to date, 5-lb. increase is the largest recorded for a four-ply super-balloon.

"Increase in car speeds, requiring more stability and lower center of gravity of the car, has gradually reduced wheel diameters from 23 in. to 17 in., the increase in tire sections compensating for only about one-third of this axle drop. Body lines with sweeping fenders to accentuate the speed aspect have not been affected seriously by the heretofore comparatively small increases in tire sections. Today, cars are so

close to the low limit of road clearance that further wheel-diameter reduction must be offset largely by correspondingly larger tire sections, such as those of the triple-oversize super-balloons, which rather radically change the appearance of the car and tend to increase the stability but to decrease the speed aspect.

"Whether present car lines are maintained or a semi-teardrop design becomes the style, triple-oversize tires, if adopted, will compel extensive changes in fenders, both for appearance and for accommodating the tires in the fender wells.

"Super-balloon tires may never be adopted in a big way. Whether they stay or go is of less moment than that the public be given a better ride, no matter by what methods. Super-balloons will stimulate work on cushions, springs, shock-absorbers, unsprung axle weight and independently sprung wheels, along with other problems involved in front ends that get nervous when air pressure is neglected.

Balloons in "Side Door"

"The portal of entry of the balloon tire in 1923 was by the side door as a replacement tire in the field. The super-balloon got its impetus in the same way. Even in present hard times, the perhaps unsuspecting public appears willing to part with from \$50 to \$100 to have something different in tire equipment, without adequate assurance by the vehicle maker or the tire maker that the car as a whole will perform better or even as well as before. The new tire has eye appeal as well as a certain popular ride appeal. Replacement sales started with the larger distributors in the larger cities where rough streets permitted of convincing demonstrations. The demand for super-tires exceeded expectations to so great an extent that car dealers passed back the word to their general sales managers that supers should be offered as optional equipment.

"Naturally, the engineers balked at this idea. They had just released new models, of the best value and performance that had ever been offered to the customer. They were thinking, perhaps, about body streamlining and independently sprung wheels and did not relish another major change in type of tire. Tires are giving phenomenal service, and the car is designed to perform on medium air pressures. Why throw a monkey wrench into design when curtailment of development expense was the order from the comptroller?

"Had the National Automobile Chamber of Commerce and the original equipment-tire makers recognized the magnitude of the changes that super-balloons may eventually require, and the immediate expense of the necessary development work, the movement might have been retarded and adequate time allowed, as in 1923, to work the tire into the design of new cars. Now it is too late for any retardation pressure to become effective. Very likely super-balloons will be standard equipment on some light and medium-weight cars in 1933, unless serious defects not now apparent develop in the meantime.

"I do not believe that car buyers, like sheep going through a fence, blindly follow a new movement such as super-balloon tires. The few that buy blindly and are dissatisfied raise enough rumpus to quickly show up an over-advertised innovation. No general dissatisfaction with super-balloon tires seems to have developed, in spite of some of the monstrosities perpetrated in changeover. There is something pleasing to the car occupants in the ride on super-balloons that has been attained in no other way on cars of present

design. The super-balloon is just another step in tire evolution.

"The rolling resistance of super-balloons, as measured by deceleration, maximum speed and the gasoline economy, appears to be slightly greater for the larger tires than for standard balloons.

"Every car on which supers have been tried has developed front-end nervousness; some quite a lot, others very little, but corrective measures, either by car engineer or some of our expert service-station mechanics, have in every instance in my experience produced a remedy that quieted the tramp and shimmy and produced a reasonably acceptable ride at rather low air-pressures.

"For the largest and speediest cars which are near the reduction limit, the problem is one either of power steering, which is likely to be more complicated and decidedly more expensive, or of using a more efficient type of manually operated gear.

"A series of blowout tests was run recently to compare driving control of 7.50-15 four-ply tires on 6.00-in. drop-center rims and with 6.00-17 four-ply tires on 3.62-in. drop-center rims. Holes were blown in the tire and tube side-walls by cartridges electrically set off through a contact switch within the car. The speed of the car, which weighed 3800 lb., was between 65 and 70 m.p.h. when blowouts occurred. The tires went flat in approximately 1 sec. (Figs. 11 and 12). The experience of the driver was that the super-balloon tire blown on a front wheel produced a harder pull on the steering-wheel toward the side of the blowout than when the standard size tire let go, and that it might be difficult for the average driver to right the car. However, after the steering had been righted, the car control, down to a stop, appeared easier with the larger than with the smaller tire. This probably is due to greater rim width and to less "fight" in the more flexible, larger-section tire on the wider rim. There seemed to be no appreciable difference in car handling when blowout of the two types of tires occurred on rear wheels.

"Because super-balloons absorb more of the road inequalities than do standard tires, traction and resistance to skidding are improved.

Traction is Improved

"As regards straightforward traction, the super-balloon excels the balloon tire because of the greater contact area and the lower pressure. It is almost impossible to slip the super-balloon on a dry or clean, wet surface. Because of this, some of the tire wear and tear occasioned in the past by spinning the wheels will be transferred to other car parts.

"Again, the tires are more resistant to side skidding, which occurs on cornering or on steeply cambered surfaces when the wheels continue to revolve, but are inclined to slip at right angles to the direction of rolling.

"The advantages of larger-section tires for the landing and taking off of airplanes on sandy, muddy or snow-covered fields are applicable as well to the automobile operating under similar surface conditions. It will require a good old-fashioned winter's experience to prove that super-balloons can operate successfully everywhere without chains, but certainly fewer chains will be used for super-balloons than for the present balloon tire. From the viewpoints of traction and skidding, the new tire should prove relatively superior to the present tire under any operating conditions."

Although the super-balloon tire argument touched the commercial and technical interests of the greatest

Legislative Barrage

"... legislators, meeting in 42 states, will open fire upon truck and trailer operations with new laws unless the industry organizes to fight as it never fought before. Road-hogs, driving trucks and trailer trains, have made the public disgusted with motor hauling—thus making it easier for legislators to throttle highway transportation . . ."

Arthur J. Scaife
President, S.A.E.

number of those at the meetings, scores of other equally important and interesting discussions took place at sessions on other topics.



Trailers Now Partners Of Trucks on Highways

"... more engineering creates new uses for trailer trains . . ."

TRANSPORTATION
& MAINTENANCE

TRAILERS have become partners in transportation of the truck, James W. Cottrell, technical editor of *Commercial Car Journal*, told the Transportation and Maintenance session Monday morning.

This new relationship is bringing to trailer design an ever-increasing amount of engineering, which he said, has been largely responsible for the wide variety of uses to which trailers are being put today.

As with all transportation, however, trailer hauling faces a battery of forty-eight state legislatures, each firing with varying degrees of intensity and several from different angles.

Frederick C. Horner, General Motors Corp., pointed out at this session, for instance, that railroads are cutting rates by concentrating upon container car and coordinated freight services.

However, these are not all the shoals in way of the trailer. J. W. Menhall, president, Highway Trailer Co., expects that he and other trailer manufacturers will be out of business in a few years. "Truck manufacturers will take over trailer production," he predicted, "having access to sufficient capital to finance their sales."

He sees a future in the trailer business, however glum he may be about the destinies of trailer factories. "Advantages of shipping by trailer are so many that a large bulk of commodities will continue to be shipped in this manner. Consignees like to have the advantage of being "put on a siding—and the tractor-trailer shipments do that," he said.

Fifth Wheel Standards Needed

Standardization of the fifth wheel, suggested by Mr. Cottrell as an important step in trailer progress, was emphatically endorsed by R. B. Jones, chief engineer of The Trailer Company of America. "Trailer manufacturers look to the S. A. E. to help in this standardization," he stated, and pledged the aid of his company to furtherance of that task.

Again the octopus of legislation was sighted, when Arthur J. Scaife, president of the Society, pointed to the growing public antipathy to heavy-duty trucks and trailer trains which are operated by careless drivers. "This reaction is especially acute on week-

ends and holidays when the roads are full of motorists. Road hogs driving burden vehicles are making it easy for legislators to legislate against trucks."



ENGINE
& FRAME

Stability of Cars and Frame Design

"... loading axle at outer ends reduces shimmy troubles ..."

SHIMMY—of both low and high speed variety—tramp and wheel wobble have a basic cause which cannot be overcome by either field changes of front-end alignment or changes in frame design. Thus, Clyde R. Paton, chief engineer, Packard Motor Car Co., summarized his investigation of front-end stability.

"Carrying-on of front ends of automobiles," he said, "are symptoms of . . . a torsional vibration of the entire chassis about a longitudinal axis and this vibration cannot in many instances be sufficiently corrected by even major structural reinforcement of the frame."

In the course of the experiments a powerful stroboscope was used to show that when shimmy is produced there is a torsional vibration of the frame and body about a longitudinal axis, which at the front passed through the neutral axis of the car frame.

The point of zero vibration occurred at a plane opposite the front seat. Further study showed that all portions of the car forward of this nodal point vibrate torsionally approximately about the longitudinal and are always opposite in phase to portions rearward of this point. Magnitude of displacement was much less in the region of the body, but increased rapidly forward of the dash, having maximum amplitude at the front end of the frame.

"This discovery presented a new angle of the shimmy problem," according to Mr. Paton. Experiments proved that dampening was needed and it was thought that frames might be reinforced sufficiently to eliminate these objectional vibrations.

Test of frame stiffened in various ways and showing improvement when measured for deflection or operated on a chassis dynamometer brought disappointing results on the road. Flexible engine mountings complicated the problem.

Frame and Body is Unit

It became apparent that frame rigidity is not the most important element in front-end stability and that frame and body must be treated as a single unit. In fact, as Mr. Paton said in amplifying his written paper, "The frame, instead of being the foundation upon which the body is placed, should be considered as an extension of the body structure, to which other chassis units are attached."

Bolting the body more rigidly to the frame reduced the torsional vibration, diagonal roof bracing and reinforcing the cowl and side panels also helped. Putting weight at the front, some distance away from the neutral axis of the frame was beneficial, spare wheels and tires in fender wells were beneficial and tying the radiator more rigidly to dash and frame improved front-end stability.

Placing spring-mounted weights in ends of the front bumper proved effective. Placing unsprung weight well out from the center of the axles causes road shocks to be absorbed to a greater extent by

tires and thereby reduces shocks on the frame.

Unsprung weight has been reduced too far on some cars on the market, in the opinion of Mr. Paton. He said, "It has been found possible to greatly reduce the general harshness and improve the front-end result by loading either the axle at the outer ends or the wheel hubs with additional weight." He sees in low-pressure tires a remedy for this situation "without the use of otherwise unnecessary weight."

To cope with greater demands put upon piston rings by higher engine speeds and compression ratios, not only have ring makers been forced to refine their manufacturing, but have found it necessary to develop gage apparatus to determine minute dimensions and characteristics of the rings.

An ingenious device built by the Perfect Circle Co., Hagerstown, Ind., was described in a paper by Ralph R. Teetor, vice president, and Harry M. Bramberry of the company.

"The old method of weighing rings to determine their tension or pressure by applying sufficient load to close the joint on a diameter of 90 deg. to the diameter through the joint indicates little or nothing," Mr. Bramberry said, "since it allows only a comparison of the pressure required to deflect the back half of the ring to close the joint. This part of the ring is of little importance, and is not difficult to form."

"The most important part of the ring is the 180 deg. opposite the back half—the portion having the joint. The ring must be shaped so as to exert maximum pressure of the cylinder wall at the points, and yet have the shape of the portions on either side of the joint contact with the cylinder wall and exert sufficient pressure to prevent blowby immediately upon installation."

To attain the proper piston ring shape, the company undertook to study proportion of radial wall thickness and free-joint opening.

"From an accurate field survey, it was found that cars generally get their first ring change at about 18,000 miles, regardless of the type or performance of the original rings," he said. "This is four times the efficient life of many of the rings used," he pointed out.



HEADLIGHT
SESSION

Equalize All Headlight Glare, Safety Demands

"... experts peered into darkness for 200 nights ..."

WHAT can be seen with headlights?

Unless brightness of headlights are more nearly equalized, little can be seen, according to findings of the Bureau of Standards. Experts spent 200 nights peering into the glare of oncoming headlights to develop the report read by Dr. H. C. Dickinson on this subject. The study, underwritten by the National Automobile Chamber of Commerce in 1927, and sponsored by Henry M. Crane, has been concluded under the direction of H. H. Allen of the Bureau, author of the paper.

Special measuring devices were developed and the tests were taken under a wide range of different night-driving conditions.

The authors of the paper looked forward to a time when no headlight equipment would be brighter than three times that of the poorest on the highways. In other words, they concluded that a rigid requirement

as to both maximum and minimum permissible beam intensity would be a long step toward improved conditions.

The paper was augmented with a moving picture, photographed through a slot which represented the normal range of standard lighting in front of a passenger car. This, with other measurements taken, indicated that it would not be possible to adequately light the road for high speed under the varying conditions of night driving without greatly increasing the illumination of the headlight beams. To allow any such move unless all cars were similarly equipped, however, the danger hazard would be enormous.



CHASSIS
SESSION

Brake Drum and Lining Problems More Acute

"... larger tires, smaller wheels, demand radical changes..."

BRAKE troubles having passed "that arbitrary figure which executives have established as the dead-line for customer complaints" both drum and lining manufacturers are confronted with problems that must be solved despite all difficulties. Present-day demands are for greater durability in brakes called upon to meet more severe operating conditions.

The task of the brake drum maker was discussed by F. L. Main, sales engineer, Kelsey-Hayes Wheel Corp., and that of the lining manufacturer by Chris Bockius, Raybestos-Manhattan, Inc., whose paper was read by F. C. Stanley, chief engineer of that company.

"Brakes will undergo a radical change, especially for the heavier cars, due to the smaller size of rims required by coming developments in tires which may limit drum diameters to 13 in. or at most 15 in. . . . May not 10 in. diameter drums, or less, be applied to lighter cars? . . . With these smaller diameter brakes, power or booster operation may be desirable." Mr. Bockius' paper showed that the lining problem is difficult at present and probably will become worse.

Scoring is a problem in metallurgy, according to Mr. Main. By means of microphotographs he showed results of extensive research in metallurgy of brake drums. Drums were tested in a machine operating in a cycle of 120 seconds, 25 sec. for acceleration, 1.2 sec. of operation before cutting off the motor; a braking period of 15 sec., and a standing period of 78.8 sec. Speeds correspond to 25, 37.5, 50 and 75 m.p.h.

Slides revealed structure of the drum material as manufactured and also after tests and exposure to high temperatures, such as might be found in operation.

"Brake drums involve problems of temperature, pressure, vibration and abrasion," Mr. Main said. "We may, therefore, expect that, until we devise some type of brake which does not depend upon friction, we shall continue to have these problems. Abrasion, and more particularly that type of uneven wear known as scoring, is largely a problem in metallurgy. With present speeds and unit pressures it is possible, through correct metallurgical control to make stamped, ring-type, cast iron and centrifugally cast iron brake drums that will wear satisfactorily," he concluded.

Discussion showed that organic matter in linings is destroyed at about 500 deg. and operating temperatures are above that figure. One discussor went so far as to say that a light stamped drum type of brake "is gone after one stop from high speed."



DIESEL
ENGINES

Dutch Report Diesel Research for Shell

"... after-chamber design of Buda M.A.N. eliminates knock..."

TECHNICIANS looking forward to automotive Diesel development had the pleasure of hearing a discussion on this topic by Messrs. G. D. Boerlage and J. J. Broeze, Delft, Holland, who for four years have been doing fundamental research for the Royal Dutch Shell interests.

The study presented developed the ignition quality of Diesel-fuels, as expressed in centene numbers.

Fuel behavior in four different engines was studied to ascertain the degree of correlation. The ignition quality and thermal stability of fuels were discussed, and a fuel formula for estimating the ignition quality of straight distillate fuel oils from natural crudes was given.

New Buda Engine

A new type of high-speed Diesel engine, known as the "after-chamber" type, and originally developed by M.A.N., was referred to in a paper presented at the S.A.E. summer meeting by R. P. Ramsey, chief engineer of the Buda Company's Diesel Division. This type of engine was mentioned in a recent article in these pages on the torque characteristics of Diesel engines, and was illustrated and described in *Automotive Industries* of September 26 last, although the term "after-chamber" was not used at the time.

In addition to the compression space between the piston and the cylinder head (the combustion chamber), an air-pocket is formed in the piston (or elsewhere adjacent to the combustion chamber), into which some of the air is forced during the compression stroke. The fuel is injected as a single jet into the space between piston and cylinder head, coarsely sprayed under low pressure, and because there is only little air in this space, combustion and pressure rise at the beginning are comparatively slow. As the piston starts on its down stroke, air from the pocket in the piston flows into this chamber, and combustion of the fuel is completed. It will be noted that this system is similar to the Acro, the main difference apparently being that while in the latter the fuel is injected into the neck of the air chamber, in the after-chamber engine it is injected into the combustion chamber. It is claimed that with this system the engine performance is surprisingly similar to that of a high-compression gasoline engine.

Mr. Ramsey said the after-chamber engine will produce a b.m.e.p. of 80 lb. p. sq. in. without a smoky exhaust at speeds up to 1500 r.p.m., with a maximum combustion pressure of only 550 lb. p. sq. in. It will idle indefinitely at 150 r.p.m. Higher m.e.p.'s. are available, but they involve higher maximum pressures. In laboratory tests the engine has been run up to 2000 r.p.m. The principle seems to work even better in small-bore engines, and excellent results are being obtained with a laboratory engine of 3¾-in. bore. Cold starting is effected without the use of glow plugs, by raising the compression pressure momentarily.

Mr. Ramsey said the Buda Company had investigated the design thoroughly and had gone into production on an after-chamber engine of 900 cu. in. displacement operating at 1500 r.p.m. (at 80 lb. p. sq. in. this would yield about 136 hp.) Structurally it is

designed in keeping with the best automotive gasoline-engine practice, and it uses a high-grade commercial injection apparatus. Construction features include a monoblock cylinder and crankcase structure, removable dry cylinder liners, aluminum-alloy pistons, and alloy valve-seat inserts. The crankshaft is carried in seven main bearings with steel-backed shells, and lubrication is by pressure-feed through rifle-drilled holes in the case.

This engine is said to operate equally well with a wide range of fuels and with pump-plunger diameters varying from 8 to 10 mm., which give a ratio of 64:100 in rate of injection. The nozzles can be adjusted to give injection pressures from 1000 to 10,000 lb. per sq. in. (without affecting the operation of the engine, it is claimed).

The weight of this 900-cu. in. automotive engine, on the basis of its output at 1500 r.p.m., is about 20 lb. per hp., and it is designed for moderate speed and very long life. Bearing and shaft sizes are unusually large.

Mr. Ramsey concluded by saying that extensive laboratory work clearly indicated that ultimately it should be possible to produce a commercial automotive engine in the 500-cu. in. class, in which higher speeds and shorter life expectancy are customary, weighing about 12 to 15 lb. per hp. The life of such a Diesel should equal that of the corresponding gasoline engine, with advantages in simplicity and fuel economy. One difficulty in this field of small-size Diesels at the present time is the high cost of the injection equipment, but this will come down when quantity production is reached.

Sees New Service Problems

Looking into the future, the author believed that service difficulties would be relatively few, as compared with the maintenance problems of the gasoline engine. "Servicing requirements of the injection and nozzle apparatus will be no more difficult than those of the carburetor and ignition systems of the gasoline engine, and valve troubles will be greatly reduced with the advent of the automotive Diesel," he predicted.

The company's service experience showed that with reasonable attention to the filters and the use of a fuel reasonably free of water and abrasives, pump-plunger trouble would be of little consequence. Experience showed that practically any field trouble is traceable to some point between the pump and the nozzle.



RESEARCH
SESSION

Tests of Journals Is Reported Upon

"... in region of thin film lubrication increase in speed tends to decrease friction coefficient ..."

AN extensive series of tests on frictional characteristics of journal bearings in the region of thin-film lubrication has been conducted at the Bureau of Standards and formed the subject of a paper read at the S. A. E. summer meeting by S. A. and T. R. McKee. The testing machine used consists of four special bearings, of the same general shape as engine connecting-rods, mounted on a steel shaft set in a lathe, and held in place by a floating frame which provides a means for measuring the frictional torque. Load is applied by the coil springs fitted to the two end bearings. Oil

is fed to the bearings under a pressure of about 1.5 lb. per sq. in. through rubber tubing from a glass bottle. Copper-constantan thermocouples mounted in the second and fourth bearings, in such a manner that the junctions are close to the bearing surfaces, are used for measuring the working temperature. A water-circulating system in conjunction with the hollow test shaft provides a means for temperature control.

Particulars of Testing Equipment

The shaft was made of a high-carbon tungsten tool steel, heat-treated, ground and lapped. Its average diameter at the journals was 1.2504 in. and it had a Brinell hardness of about 179. Two types of bearing material were tested, a high-tin babbitt and a high-lead bronze. The average diameter of the set of four babbitt bearings was 1.2515 in., which gave an average running clearance (difference of diameters) of 0.0011 in. and a clearance/diameter ratio of about 0.0009. With the bronze bearings the average diameter was 1.2519 in., giving an average clearance of 0.0015 in. and a clearance/diameter ratio of about 0.0012. Both sets of bearings were faced off to a length of 1.25 in.

Both sets of bearings were tested with three mineral oils having viscosities of 75, 139 and 230 Universal Saybolt seconds at 130 deg. F. The average running temperature was about 75 deg. F., and the absolute viscosities of the three oils at this temperature were as follows: oil A (75-sec.), 44; oil B, 129, and oil C, 246 centipoises.

All results were plotted in the form of "friction coefficient vs.

ZN/P " curves.

Four test runs were made with different constant loads, the speeds being varied, and three with different constant speeds, the loads being varied. All tests were made under the condition of decreasing values of ZN/P , the test being started with a value of this expression higher than that corresponding to the minimum value of the coefficient of friction.

The results indicated that for a given bearing and lubricant, an increase in load tends to decrease the value of ZN/P at the point of minimum f (coefficient of friction); also, that



James W. Cottrell, right, who read a paper on "Use of Trailers With Motor Trucks," and Mrs. D. E. Gamble, chairman of the S. A. E. Women's Golf Committee

for a given value of ZN/P at the left of the point of minimum friction in the region of thin-film or unstable lubrication, an increase in load tends to decrease the coefficient of friction.

It was also shown by the results that for a given bearing and lubricant an increase in speed tends to decrease the value of ZN/P at the point of minimum f , and that for a given value of ZN/P in the region of thin-film lubrication an increase in speed tends to decrease the coefficient of friction.

The tests did not definitely indicate changes corresponding to those mentioned in the two preceding paragraphs as resulting from a change in the viscosity of the lubricant.

From the standpoint of friction alone, the results showed, the babbitt bearings were superior to the bronze bearings, in that at all loads the values of ZN/P at minimum friction for the babbitt bearings were lower than those for the bronze bearings at corresponding loads.

Running-in tests were made on the bronze bearings and the results compared with similar data obtained

with babbitt bearings on a previous occasion. The conclusion was drawn from the comparison that considerably less work is required to run in babbitt bearings.

While both sets of bearings were well run in before the tests were started, throughout a considerable portion of each test run the bearings were operating in the region of thin-film lubrication with the likelihood of there being a certain amount of metallic contact and a consequent tendency to change the condition of the bearing surfaces. It would be expected, therefore, that the condition of the surfaces might vary sufficiently from time to time during the test runs to have a measurable effect upon the friction.

To obtain an estimate of the approximate magnitude of these effects, in some of the constant-load series with a given bearing and lubricant, the first run was repeated after the other runs of the series had been completed. The results indicate that with any change of friction due to changes in the condition of the bearing surfaces its magnitude was relatively small as compared to the effects caused by the change in load and speed.

Winton, Industry's Pioneer, Dies at 72

by P. M. Heldt

ALEXANDER WINTON, the first man in the United States to produce gasoline automobiles on a commercial basis, died at his home in Lakewood, a suburb of Cleveland, on June 21, after an illness of two weeks. He was 72 years old.

Mr. Winton was born at Grangemouth, Scotland. He was trained as a marine engineer and came to this country while still a young man, in 1885. Soon thereafter he became superintendent of the Phoenix Iron Works in Cleveland. Later, with the financial backing of a Canton capitalist, he organized the Winton Bicycle Co.

It was no doubt because of this previous experience in the manufacturing field that he outdistanced his rivals who had built experimental cars before he entered the field, and delivered the first machine to a bona fide customer. Records show that while several sales had been reported earlier, all of these were to officials of the companies sponsoring the respective cars.

Winton's first experimental car was completed in the fall of 1896. It was a "one-lunger," that is, it was equipped with a single-cylinder engine which was arranged horizontally under the seat. The car itself was of the so-called dos-a-dos (back-to-back) type, which afforded ample room for the powerplant under the double seat.

Among its mechanical features were a "hydrocarbon feeder," the equivalent of the present-day carburetor, a low-tension electric ignition system with automatic advance, and a system of speed control whereby the automatic inlet valves of the engine were more

or less strangled by means of dashpots attached to them, controlled by means of a foot button from the driver's seat.

The engine was completely inclosed and had automatic wick oiling. The car had two forward speeds and one reverse, obtained by means of bronze gears which remained in mesh constantly and were engaged by plate-type friction clutches, one for each speed.

Drive to the rear axle was by a single central roller chain. The car was equipped with tangent-spoked wire wheels fitted with single-tube (hose-pipe type) pneumatic tires. These latter were built specially for the car by the B. F. Goodrich Co., and Winton was wont to tell of how he was required not only to pay for the tires in advance, but for the curing molds as well.

This first car was soon followed by an improved model, and during the first months of 1898 a lot of four more cars were coming through the shops.

On March 21 of that year, Robert Allison, a mechanical engineer of Port Carbon, Pa., called at the plant and made known his intention to buy one of the cars. He was given a demonstration ride by Mr. Winton, and the sale was effected on that day. On April 1 of the same year, the first to be completed of the lot of four cars, was shipped to Mr. Allison. The price was \$1,000.

Several years later Mr. Allison was induced by the Winton Co. to trade in

this original car for one of the latest model, and the original car reverted back to the company and is now on exhibition at the Smithsonian Institute in Washington.

Mr. Winton followed up his early lead with great energy. Although at the time in question the general public was much interested in horseless carriages, what animated most of them was curiosity rather than the acquisitive spirit. Moreover, companies for the manufacture of automobiles were being promoted throughout the industrial section of the country, and in order to enable the public to distinguish between those who had achieved a measure of success in building servicable cars and those who were merely broadcasting optimistic plans, it became necessary for the former to give public demonstrations of a character that could not fail to impress. On Decoration Day, 1897, Mr. Winton gave a speed demonstration on a dirt track at Cleveland and set a record of 1m. 48s. for the mile. The car used, which was rated at 10 hp., was also driven from Cleveland to Elyria and back, a distance of 60 miles, which was considered a remarkable performance at the time.

In October, 1898, it was announced that 20 of the company's phaetons (runabouts) were in the hands of owners. Up to that time this had been the only model in production, but now a surrey (two-seated car) and a delivery wagon, the latter the first of its kind in the country, were added.

All of the cars of that period were equipped with a single-cylinder 5 by 6-in. engine rated at 6 hp. and capable
(Turn to page 927, please)

JUST AMONG OURSELVES

Important Men In Attendance

THE finest S.A.E. Summer Meeting in years has just been completed. The attendance was small; it totaled somewhere around 250 to 275. Attendance at each of the sessions averaged around 50 to 75. But the brains of the engineering department of the industry were there.

An important technical executive was present from nearly every important car, truck and parts company in the industry. The quality of the attendance was higher than ever before and as a result the practical value of the sessions was improved materially.

F. K. Glynn, former vice-president, stated the situation aptly when he remarked: "The fellows who have to go home to find out the answer aren't here."

Headlight Researchers Report and Adjourn

HEADLIGHT research subcommittee held a kind of farewell meeting on Monday evening. It decided that its work had been completed, for the time being at least, and adjourned until further notice.

Stout Steps to Bat Often, But Lets Giro Ride Slide

BILL STOUT had a busy time at the meeting this year. He opened the meeting with his paper on Sunday evening; stepped in as a pinch-hitter to read H. G. Winter's paper when the latter became suddenly ill, beat a lot of people playing ping-pong and was offered a free ride in an Autogiro which the Sealed Power Corp. (formerly Piston Ring Co.) had at the meeting.

Seeing the frightened look which came on Bill's face when

this latter invitation was extended, the inviter hastened to assure him that the pilot was very competent and that he needn't be afraid about going up in the air.

Incidentally, Bill defined a perfect landing for the society: "It's always a perfect landing when you walk away from the plane."

Balloon Tire Car Gets Expert Tryouts

BERT LEMON had a Buick (U. S. Rubber test car) down at the meeting equipped with new super-balloons and a lot of the engineers tried them out. There was a swanky Graham-Paige coupe similarly equipped also, but we didn't find out to whom it belonged and thus missed a ride we'd liked very much to have had.

Progress Reported By Subcommittees

MILITARY motor transport committee had a meeting and reported progress, so we are told. Lubricants research subcommittee had a session, too. It listened to and approved progress reports on the viscosity work being done at Bureau of Standards, on the latest tests being made in the investigation of extreme pressure lubricants, and on the research concerning thin film lubrication.

Alignment Factors Elude Best of 'Em

FRONT wheel alignment committee came to the conclusion that a standard method measuring camber, caster and toe-in can't be agreed upon.

It's going to send out a questionnaire to see if there is any chance of finding camber, caster and toe-in figures universally applicable to 1932 cars.

Celluloid Balls Are Kept Busy

PING-PONG, incidentally, almost assumed a place as a major sport this year, due partly to considerable rain, of course, but largely to growing interest. . . . and don't let anybody tell you that you can't get exercise playing it, either.

Golf Loses to S.A.E. Sessions

THE golf course wasn't nearly so crowded as last year, despite the fact that only No. 3 course has a full 18 holes open. Small attendance was one reason, obviously, but another was that those who went to White Sulphur this year spent a far higher percentage of their time in sessions and technical discussions than ever before. That's what made it a great meeting.

Past Presidents In Thick of It

PAST presidents of the society were pretty numerous. Henry W. Alden, B. B. Bachman, T. J. Little, Jr., J. H. Hunt and Guy Wall attended, and Henry M. Crane sent a wire regretting his inability to get there at the last minute after having made all plans to come. That means that about 30 per cent of the living past presidents were there. Pretty good for a depression year, we'd say.

Presidential Nomination Happily Postponed

BREAKING all past precedents, announcement of the officers nominated for 1933 was not made at the summer meeting. It's a good change of policy. Under the old system, a man just about got into the presidency, when his successor was announced. Exact announcement date hasn't been determined yet, but it will be not later than the annual dinner, probably.—N.G.S.

Triple Muddle Stalls Truck Raters

by James W. Cottrell

THE S.A.E. committee on truck rating did not make Tuesday, June 14, 1932, a red-letter day in truck history, as many hoped. However, the day was not lost—it might be recorded as sunrise pink, rather than fire-engine red. The committee was handicapped by absence of a majority of its members, a situation which made final action inadvisable. Those present decided to concentrate, for the time being, upon weight factors in truck rating and to put performance and speed factors in the background.

Concentration evolved not one, but three weight figures which were approved by an almost unanimous vote. These figures of the proposed rating, in order, are: gross capacity of chassis, vehicle gross weight and the third, a new idea, weight of load carrying elements of a chassis as distinguished from power elements. It is chassis weight minus weight of engine, clutch and transmission, or transmissions. These weights are to be expressed to the nearest one hundred pounds and the weight rating of a typical truck would be 66-105-31. Expressed in full this rating shows the chassis carrying capacity to be 6600 lb., vehicle gross weight 10,500 lb., and weight of chassis, minus powerplant, to be 3100 lb. The first figure can be computed from *Commercial Car Journal* specifications by deducting chassis weight from vehicle gross weight, both of which are listed. The third figure is new.

Smith: "Chassisless Engine"

T. C. Smith, American Telephone & Telegraph Co., suggested the chassisless powerplant factor as a means of calculating vehicle gross weight and he advocated rating trucks, and classifying them, on a basis of gross capacity. The latter figure is derived from the former. Gross capacity, as defined by Mr. Smith, represents the calculated gross vehicle weight less weight of stripped chassis, that is, it represents the maximum weight of cab, body, pay load, power winch, etc., for the chassis in question.

Taking the determination of vehicle carrying capacity from the factory entirely was proposed by Mr. Smith who said, "In determining the weight rating, it is my suggestion that the gross vehicle weight be calculated and not supplied arbitrarily by the various truck manufacturers, all of whom probably approach the matter from different view points. Calculating the G.V.W. is the preferable method because it gives rating which can be compared upon the same basis."

A formula, $G.V.W. = (S.C. - P) \times 3.5$ was suggested by Mr. Smith for calculating gross vehicle weight. In the formula S.C. means stripped chassis weight, as published by factories and P is weight of powerplant including engine, clutch, transmission and accessories. The factor 3.5 is a constant.

Examples of manufacturers' gross vehicle weights compared with proposed calculated gross vehicle weights and with gross capacity, as submitted by Mr. Smith are given on page 924.

Comparison of gross vehicle weights, calculated from the formula compared with manufacturers' rated gross vehicle weights indicate that the multiplying factor 3.5 is not far out of line.

Fear Legislation

Members of the committee were impressed by the formula and figures submitted and several were almost persuaded to advocate them. But at this point the spectre of legislation which haunted practically all of the sessions at White Sulphur Springs made its presence felt, if not seen. Several members recoiled at the thought of the consequences of setting up a constant of 3.5, which when enacted into law would be a "frozen" figure preventing future development. One member remarked that establishment of such a factor ten years ago would have prevented development of the motor truck to its present state. Another member suggested that the use of new light alloys might make it possible to greatly reduce chassis weight without decrease in strength, but such engineering advance would be worse than useless if the mystic figure of 3.5 ever got into law. The committee would be no party to a move which might give legislators a chance to confound them later on with their own calculations.

What to do? Value of weight of chassis less powerplant for comparative purposes was obvious. Committee members were reluctant to give it up. It was suggested that if the figure were given keen fleet buyers would divide this abridged chassis weight figure into the manufacturers vehicle gross weight rating and the answer would be the factor used by the manufacturer. To the extent this factor was more or less than the average just so much could the manufacturers rating be considered conservative or otherwise.

Seek Definite, Concise Figure

So the figure for chassis weight, minus powerplant weight, joined the other two figures to be used as either buyers or sellers preferred, but under no circumstances to be used by any legislator, official, or commissioner for any purpose whatsoever.

Rating the weight factor alone of a truck with a set of numerals, sounding like football signals is a long way from simplification. The term "5-ton truck" was simple, definite and to the point. Later it lost much of its definiteness. It was hoped that another figure equally concise and more definite might be discovered. As a committee member pointed out, any rating to become popular must be short. He asked that one of the three figures be designated THE rating, but a round-table discussion failed to find any agreement upon a favorite.

This three-part weight rating will be recommended to the general membership of the committee, not all of whom were present at White Sulphur

(Turn to page 924, please)



Courtesy, *The American Golfer*

Rhythm Found Key to Pro

by Joseph Geschelin

"... championships are founded upon the principle of attention to detail.

"The game can't be played synthetically. Every position, every grip, every swing must be natural. Every detail must be in constant control.

"But once the swing is under way, the only thing I think about is hitting the ball. . . ."

Robert Tyre (Bobby) Jones, Jr.

RHYTHM—coordination—s-m-o-o-t-h-n-e-s-s.

On the links, at the Olympics, in the ring—these are the major attributes of the champion.

When these principles are projected into productive work, we call it "motion study." When applied to the right job, motion study will find the "one best way." And in all fairness let us say right here, that motion study is not just another device for creating robots or technological unemployment. True, it cuts costs, speeds up work; but it does so by teaching the worker how to do the job smoother, with less effort, less wear and tear of muscle and nerve—less fatigue.

Motion study is not new. But despite its widespread use, its potentialities have not yet been

plumbed. Many jobs in many plants throughout the automotive industry are just crying for some common sense motion study work that can surely produce better quality at less cost.

Nor are its benefits limited to the saving accruing from any particular application. It has been found that the greatest benefit comes as a result of building up a motion-minded organization. When people begin thinking in terms of motion study, consciously or unconsciously they tap many hidden sources of economy.

Up to now most of the effort has been concentrated on manufacturing operations, and it remained for The Sharples Specialty Co., Philadelphia, to strike out in a different direction. The problem at

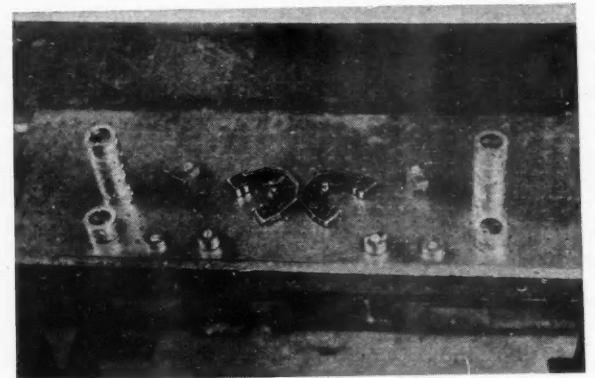


Fig. 1—Motion study determined this layout of gages on the inspection table

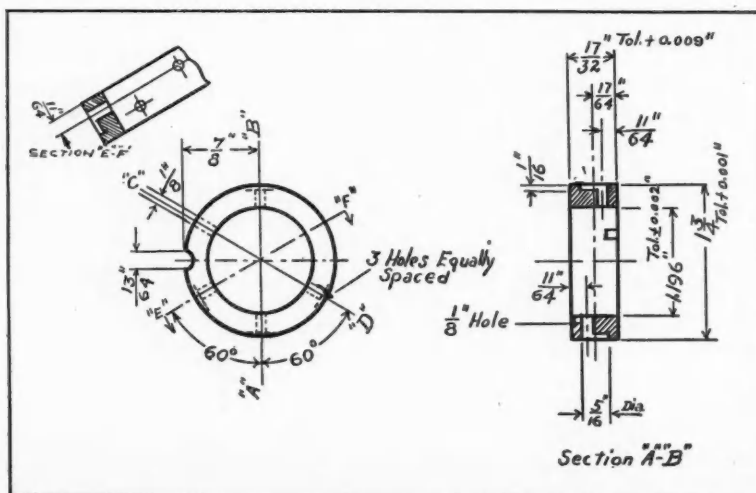


Fig. 2—Drawing of the bushing inspected on the standardized layout in Fig. 1

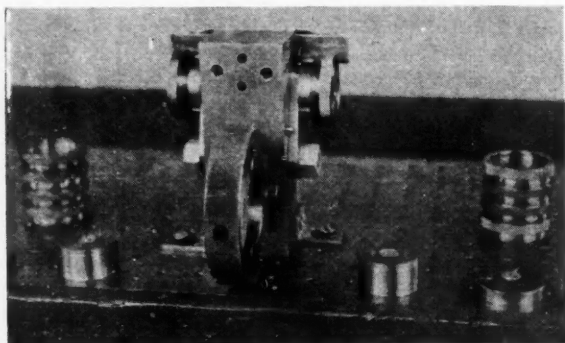


Fig. 4—Another inspection layout developed by motion study technique. Two pieces involving stepped diameters and an external thread are checked simultaneously

"go" and "no go" plug gages were cut into halves to get duplicate equipment. In the case of female thread gages, the gage is so mounted as to permit two parts to be checked at once by working from both sides of the gage. Snap gages were drilled to permit convenient fastening to the plate.

As might be expected, one of the by-products of the experimental work was the development of ways and means of combining measurements in one gage or fixture. This is a mighty fine expedient whether or not you're interested in motion study. Naturally it is basic to motion study since it eliminates a number of therbligs.

Following the analysis and the determination of the types of gages and fixtures to use, the next step was to arrange the equipment on the plate in the proper position within the normal working area. To find the "one best way" may require considerable experiment and ingenuity. But it is well worth the effort.

One of the guiding principles in positioning the equipment as well as the work, concerns the path of motion. For best results, care must be taken to avoid irregular paths as well as any obstructions which might interfere with the normal path. Fatigue is reduced and the cycle speeded up greatly if the path of motion is a straight line, or elliptical or circular in form.

Bearing these governing principles in mind, let us switch to a successful inspection layout shown in Fig. 1. This is the set-up for checking the finished bush-

ing shown in Fig. 2. Believe it or not, it is claimed that the application of motion study to this job has increased production 300 per cent.

Examining the layout of the working surface in Fig. 1, we find that the cycle of operation is a smooth, elliptical path with both hands moving rhythmically and in opposite directions. Both hands start simultaneously at the upper end of the table, picking up the work at the high stack and moving successively to the following positions:

1. Step gage for checking width.
2. Snap gage for the O. D.
3. "Go" plug gage.
4. "No go" plug gage.
5. Deposit finish work on bench or in the tray.

An important corollary of this work was the development of a process chart shown in Fig. 3 which serves to standardize and record each job. The form is self-explanatory, its most valuable feature being the layout diagram representing the table top. This diagram instructs the operator or foreman in the matter of setting up the equipment, the sequence of operations and standard time.

The solution of another type of problem involving a greater complication of inspection elements is shown in Fig. 4. This set-up is designed to check all the dimensions of knurled parts having an external thread. Motion study aside, the best part of the job was the development of the vertical fixture in the center of the table. Here in the foreground is a female thread gage mounted so that two pieces can be checked at the same time. To the rear is a mounting designed to accurately check a number of steps in diameter. "Go" and "no go" limits are indicated most ingeniously by means of tell-tale, vertical plungers. This set-up has resulted in an increase in production of 350 per cent.

Many refinements are possible for real heavy production where the savings warrant the use of more expensive equipment. For example, in a set-up such as shown in Fig. 4, one might use a number of large dial gages, or tell-tale electric lights to replace the "go" and "no go" push buttons. This simply bears out the point mentioned earlier that there is no limit to the things that can be accomplished once the time study man and the operator become motion-minded.

W. A. Hutchinson, factory manager of Sharples, is convinced that motion study will reduce their inspection cost from 25 to 35 per cent with only a moderate outlay for equipment. How much greater these savings might be when applied to really high production jobs is well worth thinking about.

Cost of Producing Synthetic Gasoline

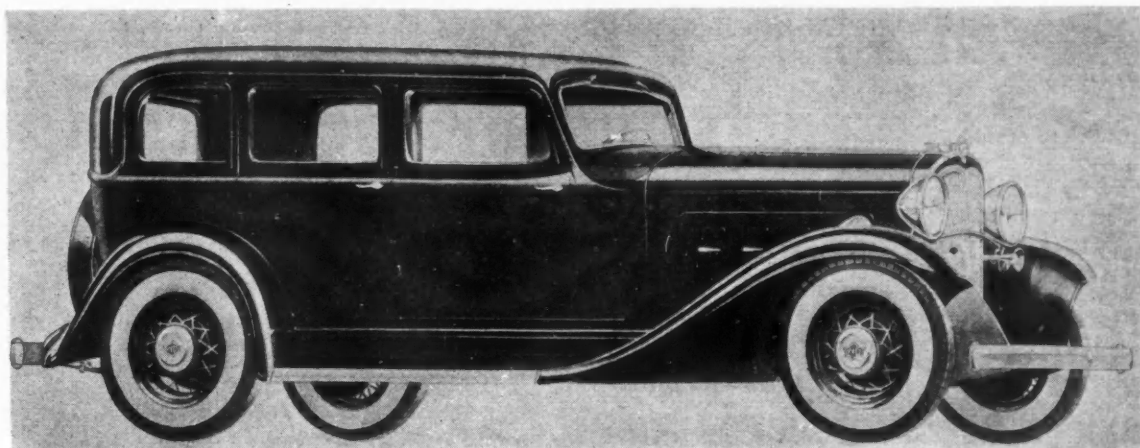
ACCORDING to statements made by Dr. W. R. Ormandy in a paper entitled "Coal, Smokeless Fuel and Oil from the National Standpoint," published in the Journal of the Institute of Fuel, it may be assumed that for every 1 2/3 tons of coal passed through the autoclaves, approximately 2 1/3 tons are necessary for all other purposes.

To make one ton of gasoline, approximately 4 tons of coal are necessary in all. In the discussion of the paper, Dr. C. H. Lander said the British Bergius Syndicate had produced on a fairly large scale 160 gal. of finished gasoline from each ton of coal treated (not of coal used).

Dr. Lander further said he did not dispute the cost

of petroleum production by hydrogenation of 7d. per gallon and said he had checked a figure of 8d. or 9d. per gallon. The figure of 7d. per gallon was quoted from information furnished Dr. Ormandy by Imperial Chemical Industries, based on a production figure of 220,000 tons of gasoline per annum and an installation involving a capital outlay of £8,000,000. No allowance was made in the 7d. per gallon for interest on this sum and only 15 per cent depreciation was allowed for on those parts of the plant most liable to deterioration.

Imperial Chemical Industries' experience with hydrogenation amounts to a semi-commercial unit capable of dealing with about 15 tons of coal per day, over a period of about two years, and Dr. Ormandy questions the wisdom of "jumping" to such large units at the outset. Smaller units would, of course, increase the overhead cost.



The custom sedan in the new Willys six-cylinder line

Willys Prices Higher On Much Revised Cars

FOR the latter part of 1932 Willys-Overland is offering a completely revised line of cars, the "Streamlined Series," markedly improved in appearance and in body design, and with new sales features, the most important of which is a synchronized-shift transmission of the Warner Gear type.

As formerly, there are two poppet valve chassis series, the 113 in. wheelbase six, now called the 6-90A, and the 121 in. wheelbase 8-88A eight-cylinder line; and a single Knight-engined model, the 66E, in a custom sedan.

Both line of poppet-valve-engine chassis are now split into two distinct classifications, standard models and custom models. The latter carry as equipment such additional items as Startix automatic starter and Monroe dash-operated ride-control shock absorbers.

Prices are higher than on the former series, the majority of increases ranging between \$120 and \$135. The prices of the complete list of body models (materially reduced in number) with those of the nearest former models, are given in the accompanying table.

Among the external improvements are the sloping windshields without exterior visor, and the door-type louvers for the poppet-valve line throughout. On the Willys-Knight model there is also a new radiator shell, similar in appearance to that used on the 6-90 and 8-88 lines.

Interior refinements include a new instrument panel with larger and more readable airplane-type instruments; also arm rests and assist cords on the 6-90, etc. Outside door handles are of a new design.

Bodies have been improved particularly in the front end. The top of the cowl, the entire windshield frame, the roof front header panel, and sections of the roof side panels are all stamped in one piece, which not only adds to the structural strength, but also insures a close-

Both lines of poppet-valve-engine chassis are now divided into standard and custom groups. Mechanical changes confined to addition of Warner Gear synchronizing transmission. Bodies go slanting into present trend

fitting windshield. For the latter a new method of control has been adopted. There is a locking handle on each side, and the shield slides out in channeled guides, and can be locked in any position. Visibility has been improved by raising the top line slightly and bringing it closer to the driver.

An interesting all-steel cowl structure has been worked out. The cowl pillars are of box section, formed by two U-shaped stampings facing each other above the cowl. At the junction with the cowl these braces separate, one channel continuing down at the windshield slope angle, the other running straight down, to form a triangulated section. The sloping channel also widens out near the bottom. A heavy cross-bracing gusset plate is riveted to both of the cowl pillar channel halves, the dash vertical brace, and the body sill stamping. A similar brace is to be found near the top of the cowl side panel.

The body center pillar is also of box section and heavily braced to the roof headers and the body sill, as extra insurance against sagging of the front door, which is now hung with three hinges from the center pillar.

Two ventilators, individually operated, are located in the top of the cowl on all models. Front doors virtually are of all-steel construction and are provided with rain gutters at the top. Cloth upholstery is provided on standard body types and mohair in the cus-

(Turn to pages 925 and 928)



French Diesel Operator Shows

Superior economy of oil-engines in city and highway hauling service, weighed against higher initial cost, taxes and other expenses by transportation engineer

by P. M. Heldt

AN important paper covering extensive experience with modern high-speed Diesel engines in commercial haulage work was contributed to a recent session of the (French) Society of Automobile Engineers by M. A. Audouin, engineer in charge of operations of the Industrial Transport Co. The paper is of particular interest for the reason that its tone shows the author to be entirely unbiased; in addition to emphasizing the advantages of the Diesel, he very frankly points out its weak features, and from the calculated savings on fuel costs he deducts increases in cost due to the higher initial investment, more frequent renewals of the heavier starting battery required, and the higher annual tax (in France) due to the greater piston displacement required for the same engine power. M. Audouin expresses the hope that the present disadvantages of the Diesel engine will be overcome, at least to a degree, and he concludes his paper with the statement that if this can be achieved, he can visualize a bright future for the Diesel in "our great industry."

It may be pointed out that M. Audouin's experience covered both two-cycle and four-cycle engines, of from 40 to 90 hp., running at from 1200 to 1600 r.p.m.

Starting of automotive Diesel engines involves some difficulty. They cannot be started by hand, and an electric starter is generally provided. Often the mistake is made of providing a starter no larger than that which would be used on a gasoline engine of the same cylinder dimensions. For a gasoline engine of 4.33-in. bore by 6.30-in. stroke, with a compression ratio of 4.8, the calculated maximum torque due to the compression is 145 lb.-ft., while for a Diesel engine of the same cylinder dimensions but with a compression ratio of 16, it is 725 lb.-ft. On a starting crank of 10 in. length it is necessary to exert a pull of 175 lb. to turn over the gasoline engine against compression, while with the Diesel it would take 880 lb., which is evidently far beyond the strength of the driver. However, M. Audouin considers it a mistake for the manufacturer not to furnish a starting crank, as it is often convenient in the shop for purposes of inspection or adjustment.

The cranking torque, moreover, is greatly affected by the viscosity (the temperature) of the oil, and M. Audouin states that a certain Diesel engine which drew a starting current of 800 amp. at 7.5 volts when the outside temperature was 37 deg. Fahr. drew only 400 amp. if the cooling system was first filled with water at 176 deg. Fahr. The usual truck starting batteries of 12 volts and 120 amp.-hr. capacity are inadequate for Diesel truck engines, and they deteriorate rapidly if used for that service. With starting equipment of adequate size and in proper condition, the Diesel engine starts more rapidly than the gasoline engine. The reason for this is that from the first compression and the first injection the operating conditions are practically normal. As soon as the engine has started, the truck may be started, even if fully loaded, while with a gasoline engine it is necessary to pass through a protracted warming-up period.

Up to the present the Diesel engines used by the author's company have not required any service operations more delicate than those required by gasoline engines, in spite of the higher compression pressures. On some of the engines the valves have served for from 14,000 to 26,000 miles without grinding, while with gasoline engines it is rare that a mileage of 6000 is exceeded between grindings. The pistons and cylinders of some Diesel engines do not as yet give signs of wear after 31,000 miles, while in many gasoline engines such signs become manifest at the end of 12,500 miles. The cranks and connecting rods, in spite of the more audible knocks, are behaving as well as those of gasoline engines after the mileage considered. The fuel pumps do not occasion any more worries than the magnetos on gasoline engines. Up to the present there has been no case of injection-pump failure. Immediately preceding the meeting a vehicle was placed in service which gave trouble a number of times, and M. Audouin expressed the opinion that it was due to

8 to 15% Savings

dirt in the new tanks. On only a single vehicle was it necessary to replace a choked-up injector, and that after 13,000 miles. Only a single broken high-pressure fuel tube was replaced throughout the author's experience, which covered approximately 62,500 miles of service.

Lubrication of the Diesel engine is no more trouble than the same operation on a gasoline engine, in spite of the fact that some manufacturers recommend that the crankcase oil be changed every 625 miles. The following analyses of samples of oils which had been used respectively for 625 miles in a Diesel-engine truck and 1250 miles in a gasoline-engine truck, and of the fresh oil, do not seem to justify this recommendation.

Table I
Tests of Oil Samples

	Oil from Diesel engine (625 miles)	Oil from Gasoline engine (1250 miles)	New Oil
Density at 59 deg. F.	0.919	0.918	0.925
Engler visc. at 95 deg. F.	28.75	7.90	25
Engler visc. at 122 deg. F.	12.50	4.34	11
Engler visc. at 212 deg. F.	2.26	1.63	2
Open-cup flash point, deg. F.	449	160	449
Ignition temp., deg. F.	486	170	485
Congealing temp., deg. F.	20 deg.	8	18
Conradson carbon test	2.30	3.22	0.05
Mineral matter	0.11	0.87	0.01
Asphalts insoluble in petr. ether...	1.51	2.11	0
Volatile matter	0.45	14.30	

Taking account of the drainings, the oil consumptions were as follows: Gasoline engines of 5-7 ton trucks, 1 qt. every 81 miles; Diesel engines of 5-7 ton trucks, 1 qt. every 107 miles.

After this test the Diesel engines were run 1850 miles without renewing the oil. This seemed to be a little too far, for at the end of this time the oil in the crankcase showed a higher Conradson test than the oil in the crankcase of a gasoline engine after having run 1250 miles. The conclusion is drawn from these various results that with a Diesel engine one can run 1250 miles without change of crankcase oil.

Important savings on fuel costs are possible with the Diesel engine, and the proportional gain in economy is even greater at part load than at full load. Whereas a 5-ton gasoline truck covers about 5 miles on a gallon of fuel, the fuel mileages of the different pieces of equipment in the service of the author's company were as follows: Truck B, 5 tons, 11.2; truck D, 7 tons, 7.35; truck F, 5 tons, 9.05; truck C, 12 tons, 5.6 m.p.g.

The accompanying graph shows how the fuel economy varies with the total weight of truck and load. The upper curve applies to Diesel engines, and it could not be extended to cover the lower weights because of lack of experience with trucks of less than 5 tons payload and 10 tons total weight.

From the viewpoint of smoothness and silence of operation the Diesel engine represents a step backward, and there is much room for improvement in this direction.

The majority of Diesel engines smoke slightly when they are first being started, and also when they are

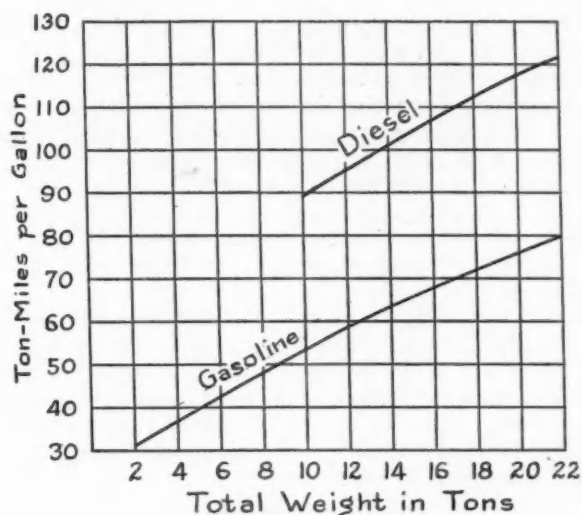


Fig. 1—Variation of fuel economy with weight of unit

(The tons in this chart are metric tons of 2200 lb.)

being accelerated. It has been noticed, however, that engines placed in service quite recently represent an improvement in this respect.

The greatest present obstacle to the extensive application of Diesel engines to vehicles for use in closely built-up districts seems to be the particularly enduring odor of their exhaust gases. This odor continues for a considerable period after a vehicle has passed a certain point, as well as after its engine has been shut down. During the trial period of a Diesel-engined vehicle for passenger transportation there were no complaints from passengers, and the odor of the exhaust was barely noticeable inside the bus. But owing to complaints of residents close to the stopping points the vehicle had to be withdrawn from service. The unpleasant odors, moreover, were accompanied by a smoky exhaust when the vehicle was first started, as well as when it resumed. M. Audouin stated, however, that the trials would be resumed—with another vehicle and in a different locality.

In Paris and suburbs remarks were passed to the drivers of Diesel trucks, but, so far as the management knew, no action had ever been taken against them. The odor of the exhaust also is a major obstacle to the establishment of garages for Diesel-engined trucks in built-up districts, especially garages for a large number of vehicles. It is to be feared that the frequent passage of vehicles over the same road will result in justified complaints from nearby residents. M. Audouin expressed surprise that this objectionable feature had not yet been overcome in Germany, the land of chemical industry and of Diesel engines, in spite of the fact that in that country certain municipalities had forbidden the passage of Diesel-engined vehicles through their streets. The problem had been taken in hand in France, but the chemical experiments which had been undertaken had not, up to the present, given any tangible results.

Certain gas oils are being offered in France at a somewhat higher price, which are said to have the property of burning without smoke and without odor. M. Audouin stated, however, that these properties were not confirmed in the trials to which his firm subjected this gas oil. Under certain conditions a slight reduction in consumption was obtained with this fuel, but not enough to warrant its higher price.

Creeping and spilling of the fuel on the outside of the tanks and on parts of the body make these parts untidy. For this reason fuel tanks will in future be suspended from the chassis, at the sides, underneath the overhanging body. Fire risks being negligible, the tanks may also be placed under the hood. Notwithstanding statements which have been made to that effect, the creeping of the fuel is not of such a nature that all parts of the vehicle become progressively covered with a coating of oil to which the road dust adheres.

The company is using a dozen 7-ton trucks for the transportation of crude oil, and although the tanks are soiled, especially by slopping over while they are being filled, the creeping oil has never reached the driver's seat nor those parts of the chassis which are not directly exposed to the drippings and projections of oil during the filling process.

Owing to the absence of inlet manifold vacuum in a Diesel engine, it is impossible to use a vacuum brake booster, except by providing a special air pump and a vacuum reservoir. Compressed air with an air reservoir, hydraulic pressure and a mechanical booster seem to be the preferable solutions of the problem.

A 5-ton Diesel truck costs about 20,000 francs (\$800) more than a similar gasoline truck, and this difference in price may be explained by the high cost of preparing for manufacturing operations and the small lots manufactured. In the future the price difference will be greatly reduced, and any difference will be justified only by the greater weight of the Diesel and the higher cost of the injection pump and injector valves, as compared with the magneto and carburetor.

The weight per horsepower of the gasoline engines used on the 5-ton trucks is 17.6 lb.; that of the Diesel engine, 22 lb., which is 25 per cent more.

The cost of a gasoline engine for a 5-ton truck is about \$800, and the extra cost of a Diesel engine,

therefore, should not exceed \$200. With an extra cost of \$800, the extra amortization, on a basis of 100,000 miles, amounts to 0.8 cent per mile.

The French annual tax (or registration fee) on commercial vehicles being based on the piston displacement, a Diesel-engined truck similarly powered has to pay about 20 per cent more tax than a gasoline-engined truck.

At present, starter batteries in Diesel-engined trucks in city service have a life of at least 9,000 miles. Assuming the starter batteries of gasoline trucks to have a life of 12,000 miles in the same service, and the capacity of the latter to be only half as great as those on the Diesel trucks, the additional cost per mile is about 0.2 cent, figuring the cost of a new battery at \$24.00.

Admitting that engine maintenance occasions the same expense as with a gasoline engine, the three items of extra cost (amortization, tax, and battery renewal) figure up to about 1.2 cents per mile. The gasoline consumption of a 5-ton truck in city service is about one gallon per 4.3 miles, which at the present price of 1.40 francs per liter (21 cents per gallon) figures out to 4.85 cents per mile. The Diesel truck in the same service consumes one gallon of gas oil per 9.4 miles, which with a gas-oil price of 0.45 franc per liter (6.7 cents per gallon) figures out to 0.7 cent per mile.

In inter-city service the 5-ton gasoline truck does 6.2 miles per gallon, and the per-mile fuel cost then is 3.36 cents. The Diesel-engined truck consumes one gallon of gas oil per 10.7 miles, and the per-mile fuel cost with it, therefore, is 0.635 cent. From these figures M. Audouin arrives at the result that the saving on over-all operating costs due to the use of the Diesel engine is 3.08 cents per mile in city service and 1.58 cents per mile in long-distance work. These figures represent savings of 15 per cent and 8 per cent respectively on the total operating costs, the company's records show.

Matrix Alloy Used for Setting Die Parts

ALTHOUGH the principle is no longer new, die designers may find it advantageous to consider the possibilities of an economical method of die mounting used by a number of large organizations. After much experimental work, the Cerro de Pasco Copper Corp., New York, N. Y., has developed a technique of die design utilizing Matrix Alloy, a low temperature melting, hard setting, non-shrinking material.

Matrix Alloy is used to permanently fasten punches, punch plates, etc. It eliminates complicated holding devices and achieves considerable savings in the cost of die fabrication particularly on complicated tools or irregularly shaped punches.

In almost all die designing provision can be made in either the punch or the die part for the use of Matrix Alloy, or if desired, in both parts. The more complicated, irregular or compounded the tool, the greater the value in using the alloy. The general procedure, to be shown in the design and followed in the shop, is mere routine.

The die (or the punch) is set into the cavity that has been formed in the die shoe, secured in its position and held with the alloy, as indicated in the drawings that follow. Oversize locations are then cut for the punch parts (or die parts, if the punches are set first).

The punches are moved about manually until their correct location in relation to their corresponding die parts is secured. They are held temporarily in position with clamps or by means of a clamping and pouring jig. Matrix Alloy is poured in and allowed to solidify, the temporary clamping mechanism is removed and the assembly permanently located, yet easily loosened by application of localized heat.

Matrix Alloy is an alloy of bismuth, lead, tin and antimony developed by the General Electric Co. Its low melting point safeguards the hardened and tempered die parts. Moreover, it is readily salvaged by melting out on application of only a small amount of heat.

Report of the Springs Research Committee of the Department of Scientific and Industrial Research. Obtainable from British Library of Information, 270 Madison Ave., New York.

This is a general report of the Springs Research Committee which was appointed in 1922 and has carried on a considerable number of researches on specific subjects. It contains a summary of the results obtained or conclusions reached in these researches. The Report also includes a bibliography on the subject of springs, a list of published papers and reports dealing with researches carried out for the Springs Research Committee, and abstracts of these reports.

Finds Soluble Greases Clog Radiators

Overlubrication is also given as causing deposits of gummy substance in cooling systems

DURING the past few years, since grease cups at the water pump were replaced in many makes of cars by high-pressure grease fittings, there has been much talk among service men of a "brown gummy substance" which appears to clog radiators. Anti-freezes have been blamed for the formation of this brown gum, and today many radiator specialists will insist that anti-freeze and anti-freeze alone, causes this trouble.

A laboratory of the Union Carbide and Carbon Corp., which has worked on cooling systems for several years, recently completed an investigation of this problem. It found that the common anti-freezes, such as alcohol, glycerine and ethylene glycol, have nothing to do with the trouble, if they play any part at all, they help to prevent the trouble.

It was found that:

1. Overlubrication of the water pump and the use of the wrong type of grease, causing introduction of large amounts of grease into the cooling system, followed by the action of this grease on rubber hose connections in the presence of heat, rust, and water, is the primary cause of this peculiar type of scale formation.

2. The rubbery formation was found during the test work in both water and the common anti-freeze mixtures.

3. Some of the factors influencing the rate of this formation are: Temperature, degree of aeration of coolant, type and condition of hose, impurities in coolant and amount of rust or sediment present.

4. The formation of such gummy accumulations can be prevented by exercising proper care in lubricating the water pumps on motor cars, and by the use of a "waterproof" type of grease.

On the basis of the test work done on this subject, it appears that the accumulations of the rubbery scale sometimes found in radiators are caused by frequent over-greasing of the water circulating pump, resulting in the introduction of large amounts of grease into the cooling system. This grease in the presence of rubber hose, heat, rust, and water or anti-freeze solutions is then converted to the rubbery, spongy scale found. The factors noted above are listed in the apparent order of their importance in causing the scale formation.

In the test work samples of the scale were analyzed and found to consist roughly of about 80 per cent organic matter and 20 per cent ash. The ash consisted chiefly of rust, an appreciable amount of calcium salts, and traces of carbon, magnesia and silica. The relatively large amounts of calcium were probably from grease, which is a mixture of calcium soaps and oil.

The first of a series of tests was made by subjecting samples of a light grade of grease, commonly used for chassis lubrication, to the actions of various coolants in the presence of heat, aeration, cast iron, radiator metals, and rust. Distilled water, tap water containing large amounts of salt impurities, and anti-freeze solutions of 50 per cent concentration were the coolants tested. In these tests no rubber hose connections were present. The tests were run for a total of 300 hr., about 250 hr. at 190 deg. F. and 50 hr. at room temperature. During the entire period the grease showed no appreciable change. While the test solutions were hot, the grease was fluid and oily and floated on the surface of the liquids. When cold, the grease returned to about the same consistency as originally. In view of the fact that the grease, under these test conditions showed no indications whatsoever of forming the rubbery scale, the tests were discontinued. The conclusion to be drawn was that heat, aeration, rust, hard or soft waters, anti-freeze, or impurities such as may be present in cooling systems cannot alone cause the transformation of grease or oil to the gum-like scale.

A second series of tests was made by heating mixtures of 20 per cent iron oxide and 80 per cent grease in a stream of hot air. Two such mixtures were maintained at 220 deg. F. and two at 250 deg. F. in a strong current of air for 150 hr. At the end of this time all of the mixtures had darkened considerably and had become appreciably thicker or more viscous. However, all retained their greasiness and when heated in water become fairly fluid. These tests indicated that the grade of grease contains no readily oxidisable oils, and that heat and aeration alone will not cause gum formation.

The final tests were made to determine the action of the grease on rubber hose connections. It is a known fact that excessive amounts of certain oils and greases in coolants have marked solvent actions on hose connections, causing the rubber to become soft and spongy.

The only means of preventing the occurrence of this condition in cooling systems is by exercising more care in lubricating the water pumps and by the use of a suitable grease. Pump bearings can only accommodate a small amount of lubricant, any excess usually being forced through the bearing into the coolant, and soft greases that are non-resistant to hot water may be drawn into the cooling system by pump vacuum. If circulating pumps are properly aligned and if the shafts, bearings and packing glands are in good condition, so that the excessive tightening of the packing nuts is not necessary, only a small amount of grease should be needed. This is, of course, contingent on the use of the proper grease, which is the waterproof type. Among the various makes of waterproof greases available on the market, the graphite-base type using electric furnace abrasive-free amorphous graphite is one of the most effective, as the graphite content, which is an excellent lubricant, is not affected by hot water or anti-freeze solutions and remains in the bearing long after ordinary greases are gone.

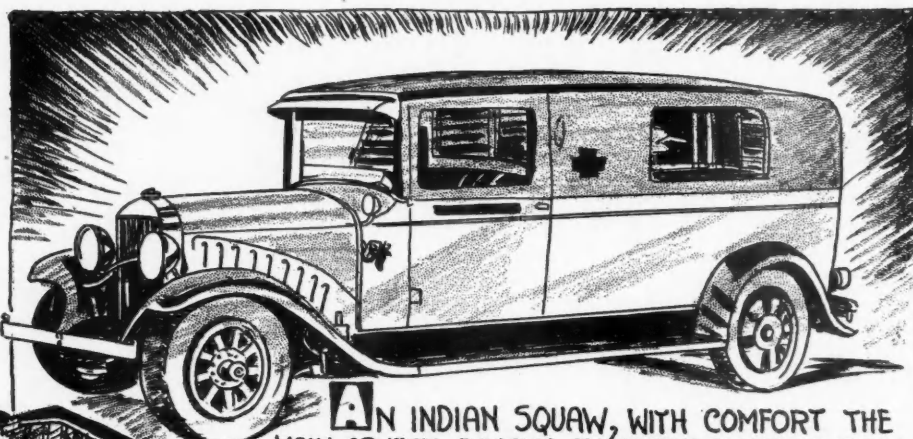
Automotive Oddities—By Pete Keenan



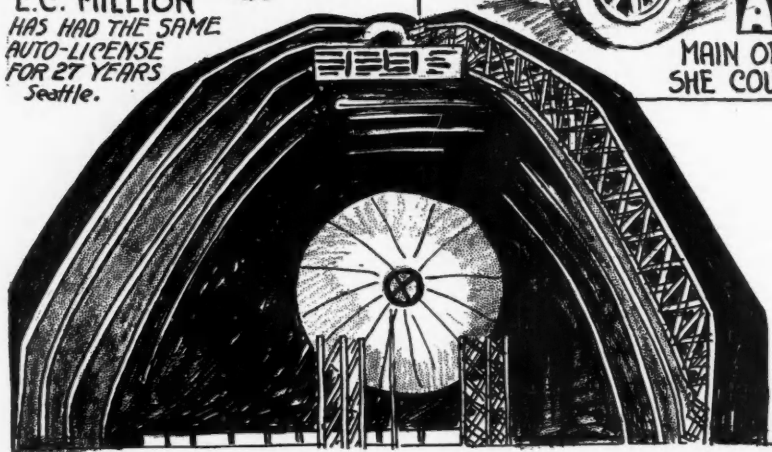
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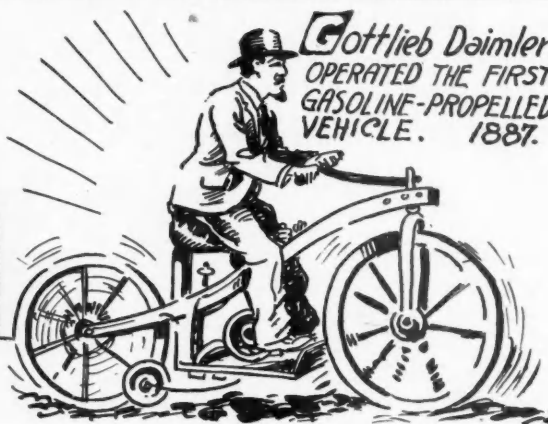
E.C. MILLION
HAS HAD THE SAME
AUTO-LICENSE
FOR 27 YEARS
Seattle.



AN INDIAN SQUAW, WITH COMFORT THE
MAIN OBJECT, BOUGHT AN AMBULANCE SO THAT
SHE COULD RIDE LYING DOWN. *Oklahoma.*



THE AKRON ZEPPLIN DOCK IS SO LARGE THAT SEVEN
FOOTBALL GAMES COULD BE PLAYED IN IT AT ONE TIME.



Gottlieb Daimler:
OPERATED THE FIRST
GASOLINE-PROPELLED
VEHICLE. 1887.

The NEWS TRAILER

Write us if you know an oddity

This is to record the official demise of the Oakland Motor Car Co., which is no more and now appears as a parenthesis in a listing which reads as follows: Pontiac Motor Co. (formerly Oakland Motor Car Co.). We feel almost as sad about it as we did when our own 1924 Oakland coupe was knocked from under us by a careless taxicab. There are a good many changes in the personnel of Pontiac since it was called Oakland. William S. Knudsen, as you already know, has been made president of the division, in addition to his duties as head of Chevrolet. The general factory manager is Floyd O. Tanner. The director of engineering is B. H. Anibal. Harold Schmidt is resident controller at the plant. The next issue of the Chilton Factory List will show a good many more changes. Watch for it.

The 1932 edition of "Facts and Figures of the Automobile Industry" appeared between an attractive silver and green cover this week. Its 96 pages seem unusually well arranged, and the amount of information in that small but very useful epitome is increased from previous issues. Congratulations, Oscar P. Pearson,

statistician, and Stephen D. Bryce, manager, Information Department, National Automobile Chamber of Commerce.

What has become of the old-fashioned "good will" which used to have a prominent place on every balance sheet? Its recent history in the automotive industry has been noted by F. R. Babcock, advertising manager of Nash Motors, who, in analyzing 1931 financial reports says: "The item of 'good will,' whose capitalization has been increasingly frowned upon by the best corporate practice during the last decade, is evident in the statements of only three companies. The others either give it no asset value or place a nominal value of \$1.00 in their statements for the 'good will' item. General Motors leads, with a 'good will' figure of \$51,939,156. At the end of 1931 Chrysler had a 'good will' figure of \$25,000,000, and Studebaker showed \$19,807,277. Nash, Hupp, Willys-Overland and Auburn carried their 'good will' at \$1.00 respectively, while Packard, Graham Paige, Hudson and Reo eliminated it entirely."

NEWS

Treasury Explains How Taxes Fall; Difficult Points in Application

by L. W. Moffett

WASHINGTON, June 23—Taxes galore on automotive and related products became effective on Tuesday of the present week. They strike in every direction. Automobiles, trucks, parts, accessories, tires, inner tubes, gasoline, and lubricating oils are caught in the mesh of the Internal Revenue collectors.

Administrative provisions and regulations have just been issued by the Bureau of Internal Revenue. They give in great detail the means of applying the various taxes, their scope, manner of payment, and penalties for failure to pay. The principle of the tax, a manufacturer's tax, calls for payment of the finished product as it goes to the ultimate consumer. The purpose is to avoid pyramiding. However, the term "finished product" is only relative. What may be a finished product for one source of consumption may be only a semi-finished or raw product for another source. Tires bought by the motorist to put on his car are a finished product. Tires bought by the automobile or truck manufacturer are only a part of his completed product. In the case of the tire sold to the dealer and then to the ultimate consumer the tax is paid by the manufacturer and included in his invoice. But when sold to the automobile or truck manufacturer, the latter pays the tax on tires and tubes which applies to the tire and tube maker originally, and is permitted to take credit—3 per cent on passenger cars and 2 per cent on trucks—against the price for the tires and tubes. These rates, however, do not cover the taxes of 2½ cents per pound on tires and 4 cents per pound on tubes paid by the automotive maker to the tire and tube makers. These poundage rates are paid by the tire and tube maker when selling to jobbers and retailers, as well as when selling to manufacturers of cars and trucks and passed on.

The regulations make clear the distinction in the system of taxation in its various forms. The maker of chas-

sis and body, if selling to a user who is going to assemble one to the other, as the placing of a body on an old truck chassis, would pay the tax on the body. But the maker of chassis and bodies who sells to the manufacturer of automobiles and trucks pays no tax. Instead it is paid by the maker of the completed car or truck.

The principle applies to the other products going into the manufacture of an automotive vehicle. However, it is provided that a manufacturer "may not lessen his sale price of chassis, body, or motorcycle by billing separately parts and accessories which are considered equipment for the article in question." Accessories take a tax of 2 per cent of the wholesale price.

Different rates apply on combinations of chassis and bodies. A truck body installed by a manufacturer on an "other automobile chassis" manufactured by him requires recording and billing the sale at the rates of 2

(Turn to page 926, please)

Canadian Financing Off

OTTAWA, June 21—The figures for automobile financing show an increase in May, 1932, as compared with April, 1932, and indicate a 39.9 per cent falling off in financing as compared with the corresponding month in 1931.

The total number of cars financed was 9573 in May, 1932; 7284 in April, 1932, and 14,536 in May, 1931; and the amount involved was \$3,794,437 in May, 1932; \$2,973,288 in April, 1932, and \$6,317,180 in May, 1931.

New cars financed were 3158 in May, 1932; 2406 in April, 1932; and 5500 in May, 1931; while used cars financed were 6415 in May, 1932; 4878 in April, 1932, and 9036 in May, 1931.

Financing of new cars amounted to \$2,025,498 in May, 1932; \$1,575,273 in April, 1932, and \$3,439,738 in May, 1931. Financing of used cars amounted to \$1,768,939 in May, 1932; \$1,398,015 in April, 1932, and \$2,877,442 in May, 1931.

Highway Bill Withdrawn

WASHINGTON, June 23—Representatives Michener and Mapes of Michigan last Tuesday caused the withdrawal of a bill authorizing federal aid for highways in 1934 and 1935 of \$84,000,000, to be apportioned Jan. 1, 1933, and appropriated one year from now. The bill was passed previously by the Senate and had been reported out by the House Committee. The action of the Michigan representatives was based on demands for economy.

It was pointed out that the appropriation of \$108,000,000 for the fiscal year 1933 for highway construction had been included in the Agricultural appropriation when it was passed. The Garner bill provides for an additional \$150,000,000 as a part of an emergency appropriation for public works. The Wagner bill provides for \$132,000,000.

The bill blocked by Representatives Michener and Mapes authorized \$100,000,000 but deducted from it is \$16,000,000 in repayment of the 1931 emergency appropriation of \$80,000,000. It is believed that with it being made clear that the \$84,000,000 is a regular authorization and is to be added to by other authorization that objections to it will be removed and that it will be passed.

Moves to Restrict Rail "Service"

I.C.C. Examiner Proposes Uniform Charges for Handling

WASHINGTON, June 23—Wasteful practices of railroads in loading and unloading freight by means of cranes, derricks and other equipment without cost to shippers will be brought to an end and proposed schedules of the carriers making a uniform charge of 50 cents, minimum \$5 per shipment, in official classification territory except New England, will be put into effect if the Interstate Commerce Commission adopts a recommendation of Examiner O. L. Mohundro. The report is based on an investigation which developed the fact that in some instances the cost of the service absorbed all the net revenue from hauling freight, where there were many instances of its absorbing 40 to 50 per cent. The service has grown to large proportion due to competition between railroads for freight. The report and proposed charges for the service are matters of interest in view of complaints of railroads about motor competition depleting their revenues when the revenue-reducing practices the carriers have been engaging in themselves were declared to be unlawful.

Triple Muddle Stalls Raters

Point at Issue
Involves Source
of Judgments

(Continued from page 913)

not all of whom were present at White Sulphur Springs, for adoption as a truck rating. It will be noted that the grade ability factor and speed figure which form the other two factors of the proposed three-part rating, before the committee have been omitted. This does not mean that formula mathematics have been abandoned. In fact committee members present voted to approve the formula as a means of calculating performance ability of a truck and also to approve the assumptions concerning horsepower per cubic inch and overall efficiency from engine to tires embodied in the formula. With this formula, ability of any truck can be calculated readily. Mr. M. C. Horine, Mack, again spoke in favor of his method of denoting performance ability in a single figure which could, by simple calculation, be made to apply to different grade and speed conditions. Other members favored separate grade and speed figures derived from the modified Buckendale formula. It was decided to approve the formula and allow truck owners, and other interested parties to work out single or double answers by lead pencil and paper or slide rule, as they pleased.

The basic point at issue in truck rating is whether it shall be based upon truck manufacturers' judgment or based upon factors which may be applied by any outside agency. It appeared some time ago that manufacturers were, in some instances, picking truck ratings in tonnage from hats. It was evident that the picking was not always based upon the same engineering factors.

Early work of the rating committee was with the Buckendale formula which gave a means of mathematically determining vehicle gross weight from published facts about truck chassis and assumed figures for grade and road resistance. Later the formula was switched around so that it gave performance ability from a fixed vehicle gross weight, in the proposal before the rating committee at the Detroit meeting and at White Sulphur Springs the basic figure of vehicle gross weight was left to factory judgment with the sole restriction that the factory must equip the chassis with tires large enough to carry the rated gross vehicle weight.

Committee action leaves truck rating about one step removed from ideas expressed at the January meeting in Detroit. The Buckendale formula discussed at length at the Atlantic City meeting gave the truck manu-

Examples of Manufacturers' Gross Vehicle Weights Compared with Proposed G.V.W. and with Gross Capacity

Make and Model	A	B	C	D	E
	Chassis Stripped Lb.	Engine Clutch, Transmission Lb.	Calculated Gross Weight Lb.	Manufacturer's Rated G.V.W. Lb.	Gross Capacity Lb.
Autocar A	5,530	1,490	14,140	12,000	8,610
Autocar R	5,370	1,380	13,960	11,400	8,590
Chevrolet LT	2,855	630	7,790	8,200	4,930
Diamond T 216 B	3,300	725	9,010	8,000	5,710
Dodge F30	2,756	683	7,260	8,270	4,500
Dodge G43A	3,345	754	9,070	10,000	5,720
Ford AA	2,847	482	8,280	8,400	5,430
Ford BE	3,040	482	8,950	8,400	5,910
GMT T19	3,430	692	9,580	10,000	6,150
IHC A3	3,711	894	9,860	9,800	6,150
Mack BL	4,200	1,090	10,890	10,500	6,690
Reo 1A	3,055	655	8,400	8,000	5,350
White 611	4,800	1,080	13,020	11,500	8,220
IHC A4	5,359	1,275	14,290	13,360	8,940
GMT T45	5,035	922	14,400	16,000	9,360
IHC A6	6,200	1,275	17,240	18,700	11,040
GMT T61	6,790	1,183	19,620	22,000	12,830
IHC A8	12,500	2,600	34,650	36,500	22,150
GMT T85	10,994	2,037	31,350	30,000	20,360

Gross weights in column C are calculated from weight of chassis minus engine, clutch and transmission. The formula is gross weight = 3.5 × (chassis weight column A minus weight of engine, clutch and transmission given in column B). Gross capacity in column E equals calculated gross weight (column C) minus chassis weight (column A).

facturer no part in determining vehicle gross weight or any of its component weights. Vehicle gross weight as tentatively approved at the January meeting gave the truck manufacturer complete and exclusive control over establishing vehicle gross weight. The White Sulphur Springs version allows the manufacturer to establish the vehicle gross weight rating, but supplies a chassis carrying capacity figure for classification and the abridged chassis weight figure which may be used by fleet owners to check other figures.

Highway Users Hear Schon

RICHMOND, VA., June 20—At a recent meeting of the board of directors of the Virginia Highway Users' Association, formerly known as the Virginia Motor Truck Owners' Association, Pierre Schon, sales engineer of the General Motors Truck Company, presented statistics supporting his contention that the motor truck owners of Virginia and the other States of the country are paying, in proportion to their volume of business, more taxes than the railroads. His contention was in conflict with the assertion of McCall Frazier, State Director of Motor Vehicles, who declared that the truck owners are not bearing their fair share of the tax burden.

Reo Commercial Sales Show Gain

DETROIT, June 21—May new Reo speedwagon and truck sales in 31 states for which official registration statistics are available, are 24 per cent ahead of corresponding May 1931 deliveries. Total Reo commercial vehicle deliveries reported to date this year are 13.4 per cent above the corresponding total for the first five months last year. This is the 11th consecutive month Reo commercial vehicle sales have recorded gains.

Wins Roby Race

CHICAGO, June 20—"Stubby" Stubblefield of Los Angeles, driving a Gilmore Special, won the 100-mile A.A.A. race at Roby speedway yesterday before a crowd of 20,000. Other drivers were placed approximately because the race was terminated as soon as Stubblefield crossed the finish line as a result of disorders among the spectators probably unrivalled in the history of automobile racing.

One spectator was injured when a mob of 5000 broke into the speedway. The man was struck as he ran across the back stretch to get into the infield. His legs were broken.

Stubblefield's victory, scored at an average of 76.27 miles an hour, added 120 points to his total in the race for the A.A.A. championship. Placings for the other drivers were awarded as follows: Al Gordon, Long Beach, Calif., second, 90 points; Bill Cummings, Indianapolis, third, 80. The order of the remaining drivers was: Howdy Wilcox, 70; Sam Ross, Ann Arbor, 60; Bob Carey, Anderson, Ind., 50; Joe Russo, Indianapolis, 40; Russell Snowberger, Philadelphia, 30; Freddy Winnai, Philadelphia, 20, and Fred Frame, Los Angeles, 10. Louis Schneider, Indianapolis, and George Barenger were placed tenth and eleventh respectively without points.

Stubblefield took the lead when Wilcox's Lion Head Special went into a spin at the 74th lap. Bob Carey had led in his Meyer Special at fourteen miles but was flagged down three miles later when he lost control on a curve and went to the pits. From this point Wilcox gained a mile on the field until his mishap in the 74th round.

Ethyl on 5-Day Week

Adoption of the five-day week by the Ethyl Gasoline Corp. has been announced by President E. W. Webb. The change, effective July 1, applies to the entire organization.

Steel Orders Spread Thinly

Many Mills Participate in Automotive Releases

NEW YORK, June 23—While the steel market shows signs of seasonal fatigue at all ends, activity of finishing mills makes a much better showing than do ingot production statistics. A good many sheet and strip mills as well as wire manufacturers are working up semi-finished steel that was included in the ingot production figures of the year's first quarter. Automotive demand shows little change. A good deal of the routine business being placed by the leading low-priced car manufacturers is distributed over a wide number of mills and because none of them has very large orders there is much talk of a sharp tapering off in the purchases of this or that automotive consumer when his aggregate commitments have undergone relatively little paring.

In the steel bar market reports are current that all contracts on a price basis lower than the 1.60c, Pittsburgh, level, which has recently become effective, will be canceled with the turn of the month, unless specified against before then for early shipments. The tone of the steel bar market has turned firmer. Wire and wire products hold steady. Third quarter business in hot and cold rolled strips is coming out on the basis of the recently introduced list of extras for hot rolled. The sheet market is unchanged. Bolts and nuts are moving in a routine way. In short, the usual summer conditions have set in in all departments of the market.

Pig Iron—New inquiries are few and far between. The Middle West markets report no changes in quotations with the tone generally easy.

Aluminum—Quiet and unchanged.

Copper—Very little copper has been bought as the result of the metal having been placed on the dutiable list by the rider attached to the tax bill. Better foreign demand has made for a more cheerful attitude among producers. Producers quote 5½ cents, delivered Connecticut Valley, and 5½ cents delivered Middle West.

Tin—Dull and virtually unchanged. Straits tin was offered at the week's beginning at 19.40 cents.

Lead—Quiet and unchanged.

Zinc—Demand has dwindled to the year's lowest point.

Trailer Makers May Organize

DETROIT, June 21—A reorganization of the present defunct Trailer Manufacturers' Association is contemplated by leading manufacturers of such equipment. Calls have gone out for suggestions as to date and place of meeting for organizing purposes. Tentatively there has been selected July 8 at the Hotel Statler in Detroit, al-

though this date has not been generally approved as yet.

It is felt that such an organization at this time could be a major factor in presenting a more united front on the part of trailer manufacturers to legislative discrimination aimed at them. It is primarily with this in mind that agitation has gotten under way for organizing a manufacturers' association.

This publication will be glad to receive suggestions from interested manufacturers as to date and place suggestions, etc., and will place these in the hands of the organizing committee.

Tire Prices Up As Tax Goes On

Firestone Refuses to Join Other Makers in Advance

AKRON, June 21—Price increases of 11 to 15 per cent on automobile casings and tubes were put into effect here today by major tire manufacturers as the new federal excise tax became effective.

Firestone Tire & Rubber Co., however, refused to join in the price boost, executives explaining they were unable to do so because of the competition of mail order houses which so far have not revised their prices.

Goodyear, Goodrich and General officials announced they will go ahead with the price boost regardless of the Firestone statement, and indicated they expect the mail order companies and Firestone to fall in line soon.

Smaller companies in the Akron area welcomed the increase in prices and have fallen in line with the majority of the larger plants.

The price boost is the first announced here in more than five years and follows a long succession of cuts and price wars that brought tire prices to the lowest figure since before the World-War.

The increase of 11 per cent on casings and 15 per cent on tubes is admittedly slightly more than enough to care for the new tax cost and promises a larger margin of profit to the manufacturers, provided all the major companies fall in line with the new prices.

Today ended the biggest period of rush business the tire industry has known here since 1919. Every tire factory in the Akron area has worked day and night for the last two weeks trying to fill huge stacks of orders for deliveries ahead of the tax deadline at midnight last night.

The new tax of 2¼ cents a pound on casings and four cents a pound on tubes will amount to from 6 to 15 per cent increase on the retail prices of tires, officials of the companies have estimated.

Willys Offers Revised Lines

Two Poppet-Valve Engine Cars and One Knight in Series

(Continued from page 917)

tom models. The Knight-engined sedan has a combination rear-vision mirror and clock.

Mechanical changes are confined to those affected by the new transmission. Since the Warner-Gear type of synchronizing mechanism with ball-locks for the synchronizer action is well known, it will not be described here. The free-wheeling unit is retained.

Monroe ride control shock absorbers have also been previously described in these columns. The Monroe shock absorber has an orifice control of the needle valve type which by-passes the liquid in increasing amounts as the dash button is pulled out, thereby reducing shock absorber action and giving a "softer" ride for boulevard conditions.

Another mechanical point of note is the provision of a combination intake silencer and air cleaner on all models.

Body Model	Stream-lined Series 6-90A	Former Series 6-90	Increase
2-p. Roadster	\$535	\$415	\$120
2-4-p. Roadster ..	585
2-p. Coupe	650	530	120
5-p. Coach	650	530	120
5-p. Sedan	740	610	130
2-4-p. Spt. Rdstr.	715	595	120
2-4-p. Cust. Coupe	715	560	155
5-p. Cust. Sedan.	770	665	105
	8-88A	8-88	
2-p. Coupe	955	780	175
5-p. Std. Sedan..	995	830	165
2-4-p. Cust. Coupe	1,050	810	240
5-p. Cust. Sedan.	1,155	1,030	125
	66E	66D	
5-p. Cust. Sedan.	1,420	1,295	125

Plymouth Passes Daily Record

DETROIT, June 21—Plymouth Motor Corp. has announced that Thursday, June 16, witnessed the largest production in the history of the Plymouth plant with a total of 1543 units built on that day. Factory officials have estimated that approximately 8000 units will be shipped this week.

Officials have also reported that the first 29 states to report on May registrations show that Plymouth accounted for more than one-fourth the total registrations of cars in the lowest-price field, the actual percentage figure being 25.4 per cent. For the first 29 states to report on May, Plymouth sold 13.6 per cent of total cars registered.

DeSoto Names Dorris

L. G. Peed, general sales manager, DeSoto Motor Corp., has announced the appointment of J. B. Dorris, former Carolina distributor, as a field representative with headquarters in Cleveland and covering the Buffalo territory.

Tax Tangles Straightened Out By Treasury Rulings Issued

(Continued from page 923)

per cent and 3 per cent, the former the truck and the latter the passenger car tax.

In all cases where sales are made tax free exemption certificates are required of the seller. An automobile maker, for instance, would pay the tax on accessories used in manufacturing his car, but the maker of accessories from whom he bought must supply tax-exempt certificates. Jobbers and dealers can not purchase articles tax free.

Because it is a new levy, taxes on tires and inner tubes have aroused much speculation as to their application. The regulations point out that in the case of tires the tax is computed on the total weight, exclusive of metal rims or rim bases, and is computed upon the total weight of a tire or tube and fractional parts of a pound must be included. The manufacturer will be required to give evidence of the portion the tire is of the total weight when tires are attached to metal rims or rim bases. The average weight of a given size, type and grade may be used when established to the satisfaction of the commission. This would indicate that it will not be necessary to mark each tire with its weight, as originally thought would be necessary. The valve and stem will be included in the total weight of the inner tube in fixing the tax.

All lubricating oils are taxable at 4c per gallon, to be paid by the manufacturer. Imported lubricating oil is taxable at the same rate upon importation, but the importer's sale is not taxed. Grease is not taxable. A blender may not purchase lubricating oil for blending tax free. The tax of 1c a gallon on gasoline applies to sales by importers or producers, but sales to a producer are tax free. In such transactions the producer is required to supply tax-exempt certificates.

The amendment in Congress to the revenue bill covering gasoline and lubricating oil holdings is intended to prevent escape of taxes. It provides that anyone holding on June 21 over 25,000 gal. of gasoline or over 1000 gal. of lubricating oil shall pay taxes on stocks in excess of these quantities. Many refineries have their own sales organizations and the amendment partially was meant to prevent the transfer of the title for the stock in order to escape taxes.

Under the administrative provisions it is pointed out that in general the tax attaches when the title to the article sold passes from the manufacturer to a purchaser. When title passes is dependent upon the intention of the parties as gathered from the contract of sale and the attendant circumstances. In the absence of expressed intention, the legal rules of presumption followed in the jurisdiction where the sale is made govern in determining when title passes. Gen-

erally, the title passes upon delivery of the articles to the purchaser or to a carrier for the purchaser. In the case of a sale on credit, it is immaterial whether or not the purchase price is actually collected. Where a manufacturer consigns articles to a dealer, retaining ownership in them until they are disposed of by the dealer, title does not pass and the tax does not attach until the sale by the dealer. Likewise, where the relationship between a manufacturer and a dealer is that of a principal and agent, title passes upon sale by the dealer and the tax thereupon attaches.

Basis of Sale Prices

In explaining the basis of the sale price, the Bureau points out that the tax is imposed on each sale by the manufacturer of the articles, and rules are given for determining the sale price. In general, this should be the manufacturer's actual price at the factory or place of production. In determining the sale price, for tax purposes, there is included any charge incident to placing the article in condition packed ready for shipment. There is excluded (1) the amount of tax imposed under the manufacturer's excise taxes, whether or not billed as a separate item, and (2) subject to certain provisions, transportation, delivery, insurance, installation or other charges, not required to be excluded.

Where articles are sold on credit, the tax is to be returned and paid to the collector of internal revenue during the month succeeding that in which sales are made, even though the price may not be paid to the manufacturer until a later date.

Any charges for coverings, containers, etc., incident to placing the article in condition packed ready for shipment is included as part of the sale price for the purpose of computing the tax. The tax imposed on the sale of any article is not a part of the sale price of such an article. If the tax is included in the sale price of an article the amount of such tax should be excluded in computing the tax due, regardless of whether it is shown on invoices as a separate item. A manufacturer may compute the tax upon his sale price and bill the exact amount of the tax to his customers as a separate item, but where no separate charge is made as tax it will be presumed to be included in the price charged for the article.

It is provided that readjustments in sale price, such as allowable discounts, rebates, bonuses, etc., can not be anticipated. The tax must be based upon the original price unless such readjustments have actually been made prior to the close of the month in which the tax was computed is subsequently readjusted; a proper credit may be taken against the tax due on a subsequent return or an appropriate claim for refund may be filed. Where

articles are sold over a period of time under an agreement for a quantity rebate or an agreement for a so-called wholesale bonus, and an adjustment in price is actually allowed in accordance with such agreement, the tax may be adjusted in the return for the month in which the price is finally determined, or a claim for refund may be filed. Where articles are sold under an agreement which provides for a rebate in the case of a price reduction applicable to such articles remaining unsold in the hands of a dealer, and a rebate is made in accordance with such agreement, a corresponding adjustment of tax paid may be effected through a credit or claim for refund. Commissions to agents are not deductible from the price under any conditions for the purpose of tax computation. If articles sold are returned and the sale entirely rescinded by refunding the entire amount paid, including tax, no tax is payable on the transaction, and, if paid, the tax may be credited or refunded.

The "fair market price" is defined as the price for which articles are sold by the manufacturer at the place of manufacture or production in the ordinary course of trade and in the absence of special arrangements. Where a manufacturer sells articles at retail, the tax on his retail sales ordinarily will be computed upon a price for which similar articles are sold by him at wholesale. However, in such cases it must be shown that the manufacturer has an established bona fide practice of selling the same articles in substantial quantities at wholesale. If he has no such sales at wholesale, a fair market price will be determined by the Commissioner of Internal Revenue. If a manufacturer sells regularly at wholesale at several varying but bona fide rates of discount, ordinarily his average selling price for the smallest wholesale lots will be the basis of tax with respect to retail sales. All sales at wholesale are subject to tax on the basis of the actual sales price of each article so sold. If a manufacturer delivers articles to a dealer on consignment, retaining ownership in them until disposed of by the dealer, the manufacturer must pay a tax on the basis of the fair market price, which will ordinarily be the net price received from the dealer.

Penalty is provided for dealers who collect taxes on goods on which they have not paid taxes. This, of course, means collection of taxes on stocks on hand before June 21.

White Gets Big Post Office Order

An order for 435 six-cylinder trucks, costing more than \$1,000,000, to be used by the government for pickup, relay and delivery of the mails, has been awarded the White Co. by the United States Postoffice Department, at Washington.

Two hundred and seventy-five of these new trucks will have a gross weight capacity of 13,000 to 14,000 lbs.

Alexander Winton, Pioneer of Industry, Dies in Cleveland at the Age of 72

(Continued from page 911)

of operating at speeds of from 200 to 1000 r.p.m. The engine was balanced by a reciprocating weight which was moved in opposition to the piston by an eccentric on the crankshaft.

Mr. Winton continued his racing exploits long after the manufacture of his car had been well established. In the summer of 1900 he went to France and started in the first race for the Gordon Bennett trophy, but after driving 30 miles his car crashed into the ditch and he withdrew. On October 24 of the same year he did a mile in 1:06 2/5, thereby establishing a new record, on a dirt-track at Detroit.

In 1902 he built a special racer known as the Winton Bullet, equipped with a four-cylinder vertical engine, which figured prominently in the speed contests of that year.

The next year, 1903, Mr. Winton was a member of the American team which competed for the Gordon Bennett trophy, the race for which was held in Ireland that year. On the morning of the race he was unable to start his engine, and therefore never figured in the race. His team mate was Lewis Mooers, chief engineer of the Peerless Motor Car Co.



Alexander Winton as he appeared at "the decoration of the pioneers," Jan. 6, 1925. On this historic occasion the men who had served the industry during its first quarter century were decorated by the N.A.C.C. with silver medals

In May, 1899, accompanied by Charles B. Shanks, who later became his sales manager, Mr. Winton made a run from Cleveland to New York in one of his cars, finishing the trip in 47 hr., 34 min. running time.

One of the notable contests of that period, in the light of subsequent history, was a race held on the Grosse-Point Track, Detroit, in the fall of 1902. The chief event was a 25-mile sweepstakes, and among the entrants in it were Alexander Winton and Henry Ford. Mr. Winton was then one of the best-known racing drivers in the country, having taken part in many events and received much newspaper publicity. Mr. Ford, after having resigned from the Detroit Automobile Co., the forerunner of the Cadillac Motor Car Co., had started work on a racing machine which later became known as the "999." Mr. Winton took the lead at the start, but Mr. Ford soon passed him and finished about two miles ahead. Up to this time Mr. Ford had been known only locally, but his victory over Mr. Winton gained a national reputation for him.

The early Winton runabouts sold at \$1,000, but after a year or so the price was raised to \$1,200. It is worth noting that advertisements of the firm which appeared at that period carried the remark "No Agents." At the very beginning the company apparently had no difficulty in disposing of all the cars it could make. It was the Winton Co., however, which established the first direct factory branch in the automobile line, in New York, under the management of Percy Owen.

The Winton Motor Carriage Co. produced single-cylinder cars from 1898 to 1902, and cars with double-cylinder opposed engines for a number of years thereafter.

Production had increased at a rapid rate, and in 1902 the company was reorganized with greatly increased capital, and a new plant was built which at the time was claimed to be the largest exclusive automobile factory in the world. It consisted of a series of buildings so laid out that raw materials entered at one end and the finishing touches were put on the completed cars at the other.

In 1900, the Winton company, then being the largest manufacturer of gasoline vehicles, had suit brought against it by the Electric Vehicle Co. and George B. Selden alleging infringement of the Selden patent.

Counsel for the Winton company filed a demurrer, alleging the Selden patent to be void for lack of patentability, but this was overruled by Judge Cox of the U. S. District Court. Preparations to defend the suit were then made, but simultaneously steps were taken by the Electric Vehicle Co., sole licensee, to get the Winton company to acknowledge the validity of the patent and to take a license under it.



A photograph of Alexander Winton taken when he was at the top of his career in the automobile industry

The move finally succeeded, and on March 5, 1903, the Association of Licensed Automobile Manufacturers was formed, the Winton company being one of the nine charter members. Previously the Winton company had been one of the members of the National Association of Automobile Manufacturers, organized on Nov. 10, 1900, at the time of the first Chicago automobile show, and Winton was a member of its first board of directors.

The demand of the automobile-buying public gradually shifted from the single and double-cylinder cars of the early period to the four-cylinder type, and as the Winton company clung to the first-mentioned types, its business began to suffer. In 1905 it switched to what is now the conventional type.

The Winton Motor Carriage Co. was one of the first concerns in this country to adopt a six-cylinder engine for passenger-car service. It also pioneered the air starter, in 1906, and an overdrive in a 4-speed transmission.

Previous to the dissolution of the Winton Motor Carriage Co., Mr. Winton had organized the Winton Engine Co. to build Diesel engines and large-size gasoline engines for railcars and marine service. The company is now a division of General Motors Corp.

Alexander Winton was the most outstanding figure in the automobile industry of this country during a certain period of its early history. He possessed the foresight and the fortitude of the true pioneer. Perhaps his strongest characteristic was that pertinacity of mind which is both the strength and the weakness of many industrial leaders.

He was married four times; his first two wives died. In 1927 he married Miss Marion Campbell, a composer of American opera, who later on divorced him. His fourth wife, whom he married in 1930, survives. He is also survived by seven children.

N. H. Van Sicklen Dies in Chicago

Had Been Prominent in Several Companies and in Publishing

With the death in Chicago on June 21, at the age of 86, of N. H. Van Sicklen, there came to an end a long and varied career in both the bicycle and automobile industries of this country. He rode his first high-wheel bicycle in 1878 and for nine years thereafter he was a prominent contender in the track and road races which had such a hold on the youth of the country during that period. In 1890 he began the publication of the bicycle trade paper *Bearings*, which enjoyed great prosperity for some years. In 1898 this paper was merged with two others in *Cycle Age* under the management of Samuel A. Miles. Miles in 1899 established the automobile publication *Motor Age*, and Van Sicklen took this over in 1904. He continued publication of *Motor Age* until the disturbed period following the financial panic of 1907, and in January 1908 sold it to H. M. Swetland of the Class Journal Company (now Chilton Class Journal Co.)

Following the sale of *Motor Age* he became branch manager of the Knox Automobile Co. in Chicago. Later the value of the Automobile Blue Books appealed to him, and for a year or so

was engaged in their development. In the fall of 1910, disposing of his interest in the Blue Book, he became manager of the F.A.L. Motor Car Co., an assembling enterprise located in Chicago.

Van Sicklen was instrumental in the organization of the Chicago Motor Club and the Chicago Automobile Association, and served as president of both bodies. In 1913 he began the manufacture of the Van Sicklen speedometer in Elgin, which business he developed into an important enterprise before it was taken over by John N. Willys in the fall of 1919, who later disposed of it to the Stewart-Warner Corporation.

During the war Mr. Van Sicklen and his organization were engaged in the manufacture of aircraft instruments for the Government. In 1922 he became assistant general manager of the Apperson Automobile Co., Kokomo, Ind., and a few months later he was promoted to the position of general manager of the concern, which he held until its dissolution.

Mooney to Present Management Paper

"Current Problems of Industrial Management," is the title of a paper to be presented by James D. Mooney, president of General Motors Export Co., at the Management Session of the Semi-Annual Meeting of The American Society of Mechanical Engineers, Bigwin Inn, Lake of Bays, Ontario, Can., June 27 to July 1.

S. A. E. Revises Standards Set-Up

Regulations Guiding Committee Changed to Meet New Needs

Important changes have been made in the regulations of the Standards Committee of the S.A.E. in order to keep abreast of changing conditions in national and international standardization activities.

Whereas, in the past all members of Divisions constituted the Standards Committee, in future only the chairmen of Divisions will be members.

However, the scope of all the formal activities of the S.A.E. is represented on the Standards Committee, and if any future activity of the Society is not so represented, the Standards Committee will arrange for such representation.

At future annual and semi-annual meetings of the Society the general Standards Session held formerly will not be held, as the Standards Committee will meet as a committee on these occasions instead.

Provision is made that all Division reports on which there has been no dissenting vote by a Division member may be passed by the State Committee by letter ballot. No report of the Standards Committee and of the action of the Council thereon will be required at the general business session of the Society at its annual and semi-annual meetings, and reports may be approved for adoption any time during the year instead of only twice a year as previously. The new procedure was followed at the summer meeting of the Society at White Sulphur Springs, and demonstrated its effectiveness.

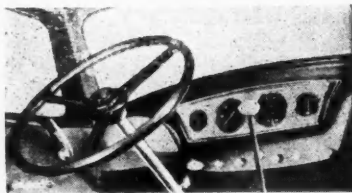
Ford Shifts Petit

L. S. Petit, who has been manager of the Columbus branch of the Ford Motor Co. for the past 12 years, has been promoted to manager of the branch at Houston, Texas. L. S. Liles, who has been manager of the Omaha branch, has been transferred to Columbus as manager. A. C. Conant, who has been assistant manager of the Columbus branch for two years, has been transferred as assistant to the Des Moines branch. The new assistant manager at the Columbus branch has not been named. The Columbus branch serves 43 counties in Ohio, 36 counties in West Virginia and 6 counties in Virginia.

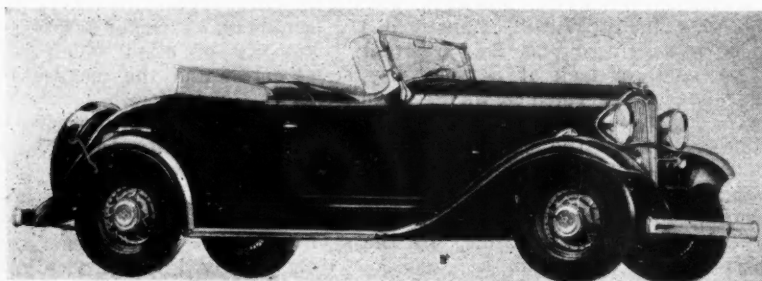
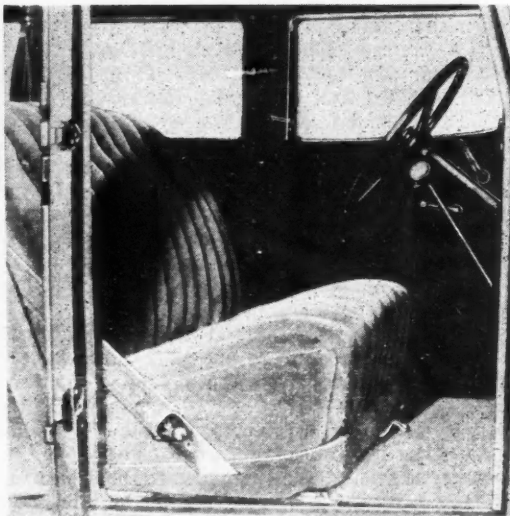
Rockne Registrations Up

A gain of 25.4 per cent in Rockne registrations in the first 34 states for May over April, has been announced by F. L. Wiethoff, sales manager of Rockne Motors Corp.

Additional Views of New Willys Line



The instrument board on the new Willys cars groups the dials and controls in aviation style (upper). The front seat of the sedan (right) is roomy, and has an easily-worked seat adjustment lever. Below is shown the 4-pass. sport roadster on the six-cylinder chassis



Truck Users Lay Legislative Plan

Operators and Factories to Join in Nation-wide Educational Organization

PHILADELPHIA, June 23—Plans are maturing rapidly for greater coordination of educational, legislative and promotional activities of all groups involved in the operations of motor vehicles on the highways.

Representatives of various automotive trade associations, truck owners associations and other industrial associations interested in truck transportation have already met informally on several occasions and are planning to get together again in Washington soon.

While it is too early to be certain of future developments, it is not unlikely that something in the nature of a Highways Users Conference, organized loosely but on a permanent basis, might evolve from these gatherings.

Active work is being done on new plans for stimulation and amplification of state truck owners associations as well, the new program involving the support of state truck association activities by truck manufacturers, automotive parts companies, large truck operators and others. Individual truck manufacturers in many cases have already expressed a willingness to foster and aid actively the state truck owner association development in their own states and definite means of taking action along these lines is now being discussed.

Indications are that this development may proceed along the lines of the "Ohio Plan," so called because it is a program which has been worked out for possible coordination of truck associations in that state. The plan is designed to bring the existing associations in Ohio into a single strong state association.

Financial support having been assured by the means indicated in the preceding paragraph, the staff of the new organization will be free to devote its time to the work of promoting truck owners' interests, providing legislators with facts desired about the truck situation and rendering full and continuous service to the entire membership.

District offices are contemplated, where necessary, thus insuring prompt service to all members. The board of directors of the state association will probably consist of two representatives of each of the local chapters which will be established throughout the state and of such others as may be needed to include the best interests of the industry. Association officers will be elected by the board of directors.

Further details of the rather broad program now under way to coordi-

nate and strengthen the power of all those vitally interested in sound development of highway transport are not yet available, but it is quite evident that a definite movement based on sound fundamentals is actually under way.

Black Remains Popular Color

The most popular color families for automobile finishing were in about the same position at the end of May, 1932, as they were at the end of May, 1931, according to the Automobile Color Index of Duco Color Advisory Service. The color families and their relative positions were:

May, 1932		May, 1931	
Black	184	Black	220
Blue	182	Blue	122
Green	71	Green	68
Brown	67	Maroon	62
Grey	40	Brown	61
Maroon	39	Grey	51

Waukesha Introduces New Engine Series

WAUKESHA, WIS., June 20—A new line of engines, known as the Full-Power line, has been introduced by the Waukesha Motor Co. Claims made for these engines are that they are of higher efficiency, smoother in operation, and have a longer life. They are said to develop from 25 to 30 per cent more power than ordinary engines of the same size. The structural material used for these engines is a new cast iron of 250-280 Brinell hardness. Production will shortly be started on three sizes of six-cylinder engines, rated at 90, 110, and 125 hp. respectively. A large four is also in production, and the line will be extended to cover the entire field which the Waukesha Motor Co. has entered in the past.

Auburn Orders Reach 170 Daily

CHICAGO, June 20—E. L. Cord, president Auburn Automobile Co., announces the company has unfilled orders for 1800 cars and that the company is receiving orders at the rate of 170 a day.

Budd Wheel Declares

The board of directors of the Budd Wheel Co. has declared the regular quarterly dividend of 1½ per cent on the preferred stock of the company, payable June 30, to holders of record June 27.

Caterpillar May Sales

CHICAGO, June 20—Net sales for May of \$1,388,944 are reported by the Caterpillar Tractor Co. of Peoria. Net profit acceptable for dividends was \$25,746.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, June 22—The very moderate improvement in retail trade in some sections of the country recently was continued last week. Inasmuch as the spring buying was small, delayed purchases of seasonal goods are now taking place. In some commodities, such as rubber tires, there has been an increase in purchases in anticipation of the new taxation shortly.

GUARANTY INDEX

The Guaranty Trust Company's preliminary index of business activity for May stands at 47.7, as against 51.9 for April and 71.4 a year ago.

FOREIGN TRADE

There was a further reduction in the level of foreign trade of the United States last month. Merchandise exports during May totaled \$132,000,000, as against \$128,764,000 during April and \$203,970,000 a year ago. Imports amounted to \$112,000,000, as against \$97,474,000 during the preceding month and \$179,694,000 a year ago.

CAR LOADINGS

Railway freight loadings during the week ended June 4 totaled 447,387 cars, which marks a decrease of 313,697 cars below those a year ago and a decrease of 488,195 cars below those two years ago.

BUSINESS FAILURES

Commercial failures during May, according to R. G. Dun & Co., numbered 2788, as against 2816 during April and 2248 a year ago. The liabilities involved in the May failures totaled \$83,763,521, as against \$101,068,693 in April and \$53,371,212 a year ago.

CRUDE OIL OUTPUT

Average daily crude oil production for the week ended June 11 amounted to 1,183,450 barrels, as against 2,181,250 barrels for the preceding week and 2,463,100 barrels a year ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended June 18 stood at 59.3, as against 59.6 for the week before and 60.2 for two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended June 15 were 38 per cent below those a year ago.

STOCK MARKET

Despite further dividend reductions and omissions and other unfavorable reports, the stock market last week maintained an improving tendency, with only occasional reactions. The volume of trading was only moderate, although it increased as prices rose. The bond market was also firm. Most issues registered moderate net gains for the week.

RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended June 15 showed increases of \$47,000,000 in holdings of Government securities and of \$30,000,000 in holdings of bills bought in the open market. Holdings of bills discounted decreased \$6,000,000. The reserve ratio on June 15 was 57.9 per cent, as against 59.4 per cent a week earlier and 61.4 per cent two weeks earlier.

John N. Willys Welcomed to Toledo; Old Associates Stage Big Banquet

John North Willys, home from more than two years' service as ambassador to Poland, was given a rousing reception June 16 by fellow townsmen and old associates in Toledo.

At a civic dinner nearly 800 business leaders thronged the Chamber of Commerce to pay tribute to the chairman of the board of the Willys-Overland Co., largely in the belief that his return promises a turning point in the financial and business difficulties of Toledo.

Mr. Willys in a carefully prepared address outlined a platform for business recovery.

He made it plain that transportation is basic to the industry of the nation and the automotive industry will probably lead the way to recovery.

He said the time has come for the five-day week. Excessive capacity dictates the plan which will in turn provide more leisure. He favors repeal of the 18th Amendment.

A fundamental change in tariff policy is also advocated by Mr. Willys. He expressed the idea that workers will just have to get costs down to a basis where American products can force their way into international trade in spite of artificial walls. A long moratorium on war debts and reparations but no cancellation is favored by the former ambassador.

Mr. Willys told his friends that he could not see his way clearly yet as to exactly what will be done, but he is ready to do it, "one way or another," because it has to be done.

His first interest, he said, was to bolster employment.

He said there would be no changes in personnel at the Willys-Overland plant and complimented the executive staff there for performing a remarkable job under most adverse conditions.

"I know perfectly well what I am doing in returning to active business life," he said. "I had a good reputation as a business man three years ago when I disposed of some of my interests and sought a measure of relaxation. I am putting that reputation on the scale and it may go down. (Shouts of "No" from his audience.) I may take a little ducking financially but one cannot be entirely selfish. I don't want to be selfish. I have done well in Toledo. I have made money here. When my company needs everything any person can give it then I want to be back and help."

Rather facetiously he said one of the troubles with Willys-Overland now is that the company doesn't owe a dollar to any bank and consequently has a hard time getting a loan.

C. O. Miniger, president of Electric Auto-Lite Co., was toastmaster at the banquet.

Words of welcome were expressed by Dan H. Kelly, president of the Chamber of Commerce; Mayor Addison Q. Thacher on behalf of the

citizens, and L. A. Miller, president of Willys-Overland Co., on behalf of the plant and dealer organization.

Many old-timers of the automotive industry were at the head table—R. A. Stranahan, H. C. Tillotson, Gordon M. Mather, and others in the Willys-Overland plant group.

A message of welcome back into the industry was received by wire from Walter P. Chrysler.

Mr. Willys said he planned to visit Detroit for a few days soon and discuss the industry with leaders there and would take a swing around the Willys-Overland dealer organization very soon. He spent the week-end in New York on financial matters.

I. H. C. Elects

CHICAGO, June 20—Directors of International Harvester Co. have elected James R. Leavell, president Continental Illinois Bank and Trust Company, a member of the board to succeed Arthur Reynolds, who resigned recently. John Stuart, president Quaker Oats Co., and William S. Elliot, general council, International Harvester Co., were elected to the board to fill vacancies since the death of Thomas D. Jones and Henry B. Utley.

Financial circles report that the truck division of the Harvester Co. continues to be the bright spot in the company's business so far this year. Truck production is being maintained at good levels and second quarter

sales are approximately equal to those of the first quarter. Officials of the company say only truck sales permitted the company to operate at a profit last year.

Robertson Back From Turkey

Major William B. Robertson, a vice-president of the Curtiss-Wright Corp., has returned home after spending four months in Turkey mapping proposed commercial air routes for the Turkish Government.

Major Robertson reports that Turkey is vitally interested in air transportation as a means of quick advancement of the country's commerce. He urged the early establishment of a 1000-mile route from Istanbul, through Angora, to Bagdad. Such a service would lessen by many days travel from Europe to the Far East. The Turkish Government is preparing to subsidize its air service through a fund which is being accumulated by a national lottery. If established, the airlines will use American-made planes, and probably will employ American transport pilots at the outset.

Ford Transfers Two

F. A. Atcheson, who for some time has been branch manager of the Ford assembly in St. Louis, has been transferred to Chester, Pa., where he will be in charge of the Ford plant there.

Mr. Atcheson will be succeeded at St. Louis by M. N. Johnson, formerly manager of the Ford assembly plant in Oklahoma City.

+ + CALENDAR OF COMING EVENTS + +

FOREIGN SHOWS

Bordeaux, Fair June
Cork, Commercial June
Southampton, Commercial July 5-9
Llandrindod, Wales, Commercial July 20-22
London, Olympia Show Oct. 13-22
Glasgow, Scottish Motor Show Nov. 11-19

CONVENTIONS

Amer. Soc. Mechanical Engineers, Bigwin, Canada (Semi-Annual Meeting) June 27-30
Natl. Association of Taxicab Owners, Chicago July 7-8
Natl. Team & Motor Truck Owners Assoc., Chicago (Annual) July 17-19
National Team & Motor Truck Owners Assn., Detroit July 17-19
American Chemical Society, Denver, Colo. Aug. 22-26
S.A.E. Aircraft Meeting, Cleveland Aug. 30-Sept. 1
American Society Mechanical Engineers, Cleveland, O. (Machine shop practice meeting) Sept. 12-17
American Trade Association Executives, Atlantic City (Annual) Sept. 15-17
Penna. Automotive Assn., Harrisburg, Pa. Sept. 19-20

Natl. Assoc. of Motor Bus Operators, Chicago Sept. 22-23
American Electric Railway Assn., Chicago, Ill. Sept. 22-23
Amer. Institute Mining & Met. Engrs. (Petroleum Division), Dallas, Texas Sept. 30-Oct. 1
Amer. Society for Steel Treating, Buffalo Oct. 3
Amer. Institute Mining & Met. Engrs. (Iron & Steel Division), Buffalo, N. Y. Oct. 3-6
National Safety Council, Washington, D. C. Oct. 3-7
American Welding Society, Buffalo, N. Y. Oct. 3-7
American Society Mechanical Engineers, Buffalo, N. Y. (Natl. Iron and Steel Meeting) Oct. 3-8
S. A. E., Annual Transportation Meeting, Toronto Oct. 4-6
American Gas Association, Atlantic City (Annual) Oct. 10-14
Natl. Hardware Assn. (Accessories Branch), Atlantic City, N. J. Oct. 17-22
American Society Mechanical Engineers, New York City (Annual Meeting) Dec. 5-9
Natl. Exposition of Power & Mechanical Engineering, New York Dec. 5-10

RACES

Altoona Sept. 5

IRREGULAR PROFILES

Generated on the Gear Shaper

..... In One Operation

.. And With a Single Cutter

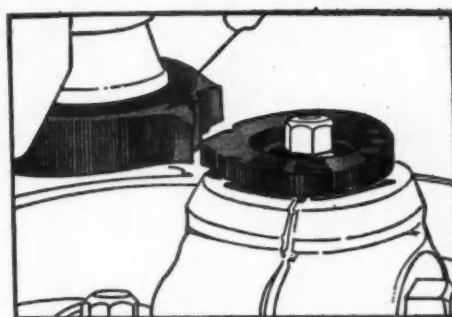
Economy in manufacture dictates that every possible additional set-up and machining operation on parts be eliminated to reduce costs. Where the work is irregular in contour, similar to some of the examples presented, the Gear Shaper Method affords a cost-cutting solution. It not only reduces the number of set-ups, but also tool costs.

In most cases it is possible to machine an irregular contour in one operation and with a single cutter. Coupled with these two advantages is the assurance of greater accuracy. Another inherent advantage possessed by the Gear Shaper Method is the ability to machine close to a shoulder or into a recess. This makes it possible for the designer to reduce the number of parts in the assembly, still further reducing set-ups and machining operations with resulting lower costs.

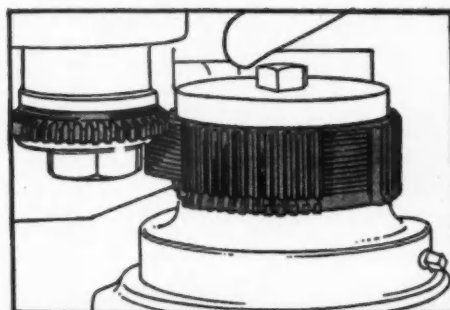
It is to your advantage to possess full appreciation of the Gear Shaper's versatility, especially at this time when costs must be cut to the "bone."

Ask for a copy of Booklet No. 10. It will introduce you to a few of many Gear Shaper possibilities. Write:

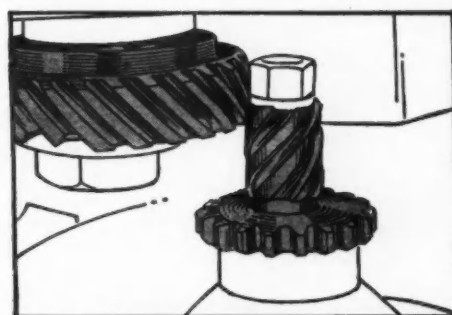
THE FELLOWS GEAR SHAPER COMPANY
 78 River Street, Springfield, Vermont
 616 Fisher Bldg., Detroit, Michigan



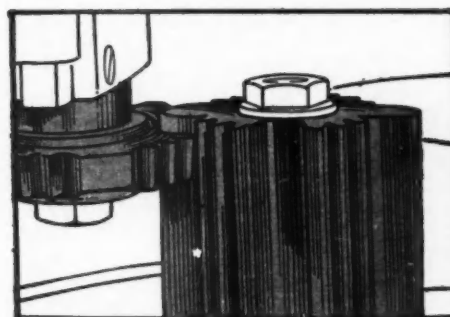
CAMS



SEGMENTS



HELICAL SPLINES



SPECIAL DESIGNS

FELLOWS

~ GEAR SHAPERS ~

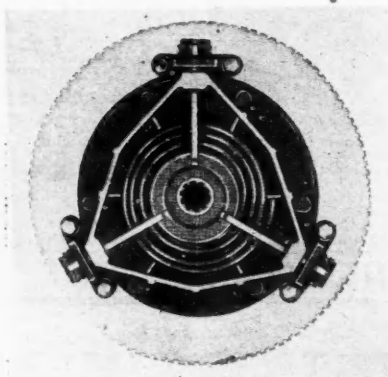
NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Chanson Clutch Model B

A new single-plate clutch, known as the Model B Chanson clutch, has been placed on the market by the Illinois Iron & Bolt Co. It is claimed for this component that it comprises an unusually small number of parts and that parallelism of action and smoothness of engagement are assured by extreme rigidity.

In order to facilitate the dissipation of heat and increase its capacity, the clutch is used without cover. To the same end the pressure plate is provided with cooling fins which also increase its rigidity. Provisions are made to assure effective cooling of the clutch spring, so it will not lose its temper.



The pressure plate is guided by three lugs of large contact area. The use of these large driving areas has made possible the use of a Y-type of three-point pressure-plate mounting, which is said to prevent trouble from expansion of parts. This reduces the possibility of the pressure plate shifting off center, which would disturb the balance. By placing the driving contacts close to the plane of the friction surface, any tendency for the pressure plate to be cocked by the driving load, and to be thereby forced out of center, is said to be eliminated.

In the design, efforts were made to reduce both the weight and the overall length, and the room which would be required by the cover if one were used is utilized for a pressure plate of increased dimensions. The clutch is intended for all automotive applications.

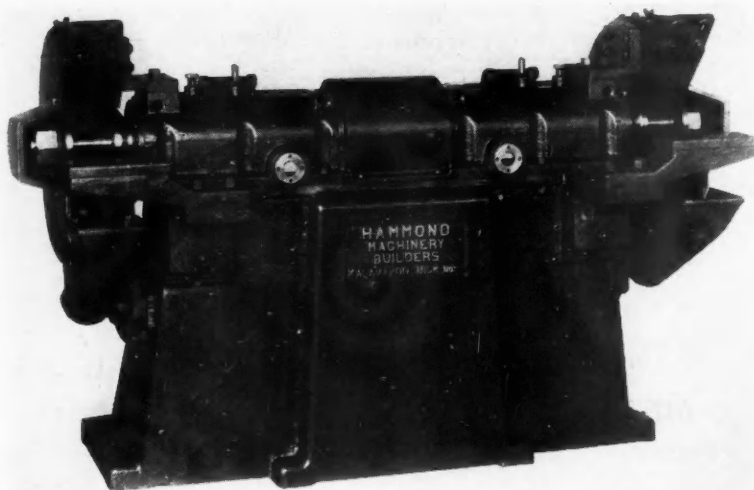
Adjustment for parallelism is made at the factory, while the clutch is being assembled, and the adjustment is locked. All sizes of the clutch may be provided with means for making adjustment for wear of facings, but the manufacturers recommend it only for heavy-duty applications, limiting adjustment to the clutch pedal in other installations.

The cushioning rate and range of the driven member are separately adjustable. Plate run-out is held to a very low limit and this, in connection with the fact that the polar moment of inertia is quite small, is said to assure a quick, full release.

These clutches are made in sizes of 9, 10, 12, 14, 16 and 18-in. diameter, which are rated at 150 to 1250 lb.-ft.

Hammond High-Speed Grinder

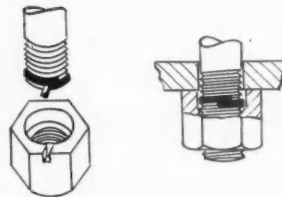
A high-speed grinder for snagging and rough-grinding work has been placed on the market by the Hammond Machinery Builders, Inc., Kalamazoo, Mich. It features two spindles with



independent drive. Each has its own motor, multi-V belts for transmitting power to the spindle, automatic motor starter with overload, low voltage and phase failure protection, and its own spindle lock. This means that both

B-B Lock Nut

A new lock nut has been placed on the market by the B-B Nut Company, Eighth Street and Columbia Avenue, Philadelphia. As shown by the illustration herewith, the nut is recessed at its inner end, and what is referred



to as a brake band, a single coil of spring wire of triangular section, is placed in the recess. One end of the coil is bent at right angles and engages into a radial slot in the wall at the recess. The "brake band" grips the thread of the screw. When the nut is screwed on, the coil is opened up and the braking action is prevented, while if it is attempted to unscrew the nut, the band grips the thread firmly. This nut can be screwed on by hand but unscrewed only by means of a wrench. The brake bands are adaptable also to locking studs, set screws, turn buckles, door-knob screws, etc.

operators work independently of the other.

Either bakelite or rubber bonded wheels operating at a surface speed of 9000 ft. per min. can be used with this machine as well as vitrified wheels operating at the usual 6000 surface ft. per min.

Wheel guards are made of heavy boiler plate steel, welded and riveted, having hinged doors and equipped with adjustable spark deflectors. They are built in accordance with A.S.A. recommendations.

When Overloads run high . . .



it takes good *Alloy* to stand the strains

ILLINOIS *alloy* STEEL

ALWAYS DEPENDABLE

High standards rigidly adhered to in every step of the production process assure uniform, dependable quality in every ton of Illinois Alloy Steel.

Illinois Steel Company

SUBSIDIARY OF UNITED STATES STEEL CORPORATION



208 South La Salle Street, Chicago, Illinois

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

National Vertical Hydraulic Drill

The National Automatic Tool Co., Richmond, Indiana, recently shipped a large, special vertical hydraulic driller which is an adaptation of the standard Natco model D20H and is equipped with a semi-automatic hydraulic Oil-gear feed arranged with the patented Natco safety foot control and emergency reverse.

This machine has a 24 x 40 in. rectangular head bored for 16 spindles and is equipped with 12 three-inch diameter upper joint assemblies, each having a single speed and neutral position. The head is equipped with roller bearings throughout.

The spindle equipment consists of a special adjustable bearing plate arranged for and complete with twelve 2½ in. diameter spindles having No. 4 Morse taper and nose adjustment. The spindles are held in a straight line parallel to the ways on the column and have a horizontal adjustment toward and away from the column of 14 in., the minimum and maximum distance being 22 in. and 36 in. respectively.

The coolant compound is supplied to the work by means of an independent motor-driven pump mounted at the rear of the column and is complete with an outlet pipe and shut-off valve which is automatically turned on with the downward movement of the head.

Mounted on the base between the two large slots is an air-operated jack which is used to support the work.

The machine weighs approximately 38,000 lb. and has a drilling capacity of twelve 1½ in. drills in steel at a heavy feed. It is approximately 16 ft. in height.

Norton Grinder Series

Continued tests with experimental, mounted abrasive wheels, points, pencils, buttons and other shapes has led Norton Co., Worcester, Mass., to develop a line of these tools, including more than 100 different shapes. They range from points 3/32 in. in diameter to wheels 1 in. in diameter.

Most of these mounted abrasive products are made with 38 Alundum abrasive, a patented brand of alumi-

num oxide which was developed expressly for tool and die work. For production grinding of small holes most of the mounted wheels and points are made of regular Alundum abrasive; for the non-ferrous and non-metallic fields there are Crystolon abrasive points and wheels.

The spindle on all the Norton products is made of a special steel which is first coppered and then nickel-plated. It is knurled and designed with a chisel end to insure permanent anchoring of the abrasive on the quill.

Langelier Swaging Machine With Hydraulic Feed

Here is the latest design Type "J" swaging machines made by the Langelier Mfg. Co., Providence, R. I. It has a capacity rating of 4 in. on tubing, equipped with a semi-automatic hydraulic feeding mechanism

Rockford Economy Lathe

A line of Special Economy lathes, featuring a built-in Westinghouse-Wise multi-speed drive, has been placed on the market by the Rockford Machine Tool Co., Rockford, Ill. The drive has four speeds, thus providing a flexible speed change arrangement in combination with the transmission. Back gears provide for more power and double the speed range.

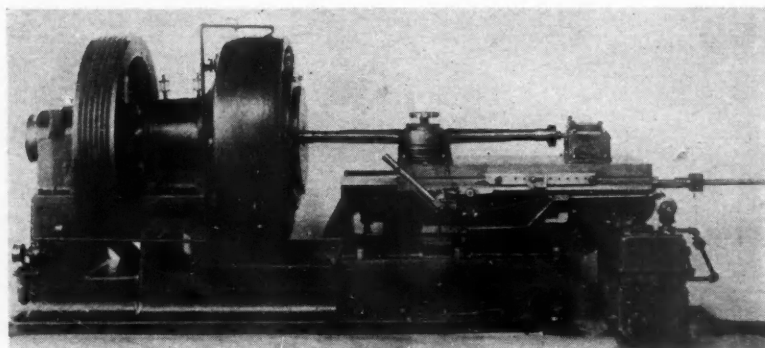
32 thread-leads or feeds are available through shifting levers. Spindle speeds change without stopping the motor. The controller located at the top of the head stock, stops, starts, or reverses the spindle.

Three sizes are available: 6½, 8, and 11 in. swing over carriage respectively. Range of speeds, r.p.m.: 22 to 600, 20 to 600, 15 to 580, respectively. Motor size: ¾, 1, 1½ hp.

This line of equipment is expected to fill the need for a relatively low-priced machine with individual drive.

sleeve bearings, and an outboard or back bearing is located beyond the flywheel. The drive is from a motor through Vee belts and grooved sheaves.

The machine base is made with a projection to receive the feeding mechanism, which is operated by a variable delivery high-pressure hydraulic



The floor space required is 12 ft. x 6 ft. Approximate weight 9 tons

tooled to handle automobile rear axle housings. The operation is the reducing of both ends after forming and welding, thereby thickening the wall to compensate for the metal removed in a subsequent turning operation and also to increase strength at this point.

The head is the two-die type, provided with a waterjacket so that the machine can be used for hot or cold swaging. The spindle is mounted in

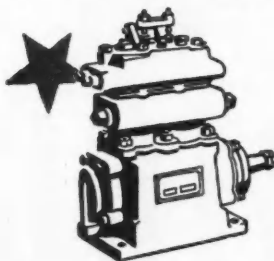
pump, driven by a direct-connected motor.

Dogs are mounted on the worktable to control the feed rate, which consists of a quick advance of the work to the die, swaging feed and rapid reverse traverse. The center fixture for clamping the housing is hand-operated, and for centralizing the work with the die an automatic air cylinder is used.



SAFETY ★ GEARED
to the
TIMES

Yesterday's brakes have no rating in the modern scheme of heavy-duty transportation. In their place stands a time-tested principle of control—Bendix-Westinghouse Automotive Air Brakes ★ Matchless is the word which best describes the traditional security of this braking system. And now, due to its almost universal acceptance as standard equipment, no one interested in the safe, swift movement of motor carriers need be satisfied with anything short of Air Brake performance ★ Bendix-Westinghouse Automotive Air Brake Company at Pittsburgh, Penna.



THE COMPRESSOR
The heart of the Air Brake, this particular unit represents an achievement of more than a half century's effort in the development and manufacture of devices which must not fail. A positive source of abundant power for brake control, it also supplies a dependable force for every pneumatic requirement of the modern motor transport.

**BENDIX
WESTINGHOUSE**
Automotive Air Brakes

anticipating your

BODY

PROBLEMS



● Much of Briggs' success is due to its ability to anticipate trends . . . With new business conditions confronting the industry, Briggs realized that an entirely fresh standard of values would be needed . . . Briggs body plants today are the most efficient in the industry. They house millions of dollars worth of up-to-date machinery that simplifies operations, saves effort, reduces waste . . . While reducing production costs Briggs likewise has improved quality. It has applied to lowest-priced bodies the experience of its custom body division, whose thinking has always been quality thinking . . . Briggs is solving the body problems of leading manufacturers in all price classes. Working with your engineers, Briggs can help you to meet current needs for highest values in the history of the industry.

Briggs designers are always anticipating style trends. Here is a member of Briggs' vast creative staff working on a miniature clay model which may be the basis of a body design used a year or two hence.



BRIGGS

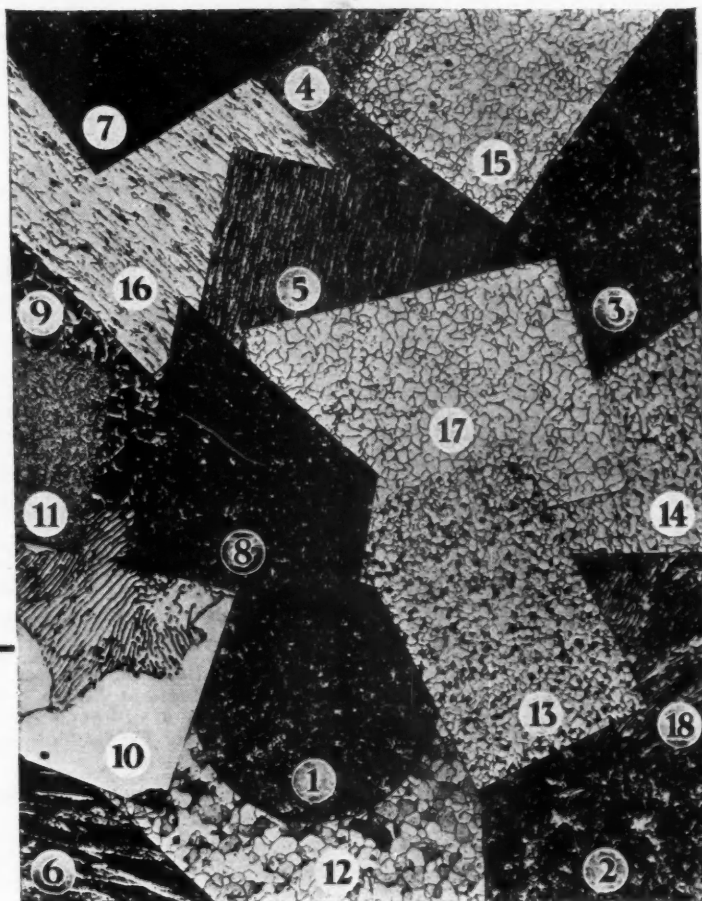
June 25, 1932

Automotive Industries



So that You may check the Microstructure

1. 200X Air patented high carbon
2. 200X Air patented high carbon
3. 200X Air patented high carbon
4. 200X Lead patented high carbon
5. 200X Cold worked high carbon showing short fibers
6. 2000X Cold worked high carbon showing ferrite
7. 100X Fine grain of oil tempered spring wire
8. 2000X Oil tempered spring wire
9. 100X Annealed high carbon steel
10. 2000X Single crystal of pearlite in low carbon steel
11. 200X Martensitic structure obtained on quenching high carbon wire
12. 200X A study in crystal orientation in low carbon steel
13. 200X Refined grain in low carbon steel obtained by water quenching from 1600°F
14. 100X Low carbon rimmed steel taken at the center
15. 100X Low carbon rimmed steel taken near the edge
16. 200X Cold worked low carbon steel
17. 200X Microstructure of pure iron
18. 2000X Pearlite in high carbon steel



Wickwire Spencer Steel Company will gladly send you a large print of this composite Microphotograph with its key. Learn the characteristic microstructure of the wire that gives you the utmost satisfaction. Purchase wire with the same characteristics every time. This method will go a long way towards solving your wire problem. Metallography plays an important role in Wickwire Spencer plants. The examination of thousands of microphotographs has proven that patenting, annealing, oil tempering and cold drawing all develop definite microstructures that are clearly discernable. The quality of iron, low and high carbon steels as well as special alloys is indicated with equal certainty. Fill in the coupon below and mail it today.

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Buffalo, Chicago, Detroit, Philadelphia, Tulsa, Worcester;
 Pacific Coast Headquarters: San Francisco; Warehouses: Los
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by Wickwire Spencer

Wickwire Spencer Steel Company, 41 E. 42nd St., New York City

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Name

Firm

Address

Do You Need New Blood in Your Finance Department?

A man of unusual qualifications is available for a position of responsibility, requiring executive ability and a comprehensive knowledge of practical finance and accounting interpretation. He is competent by business experience and background to be financial executive of a large corporation.

During the last thirteen years he has been associated with one of the largest investment banking houses. At different times his duties included:

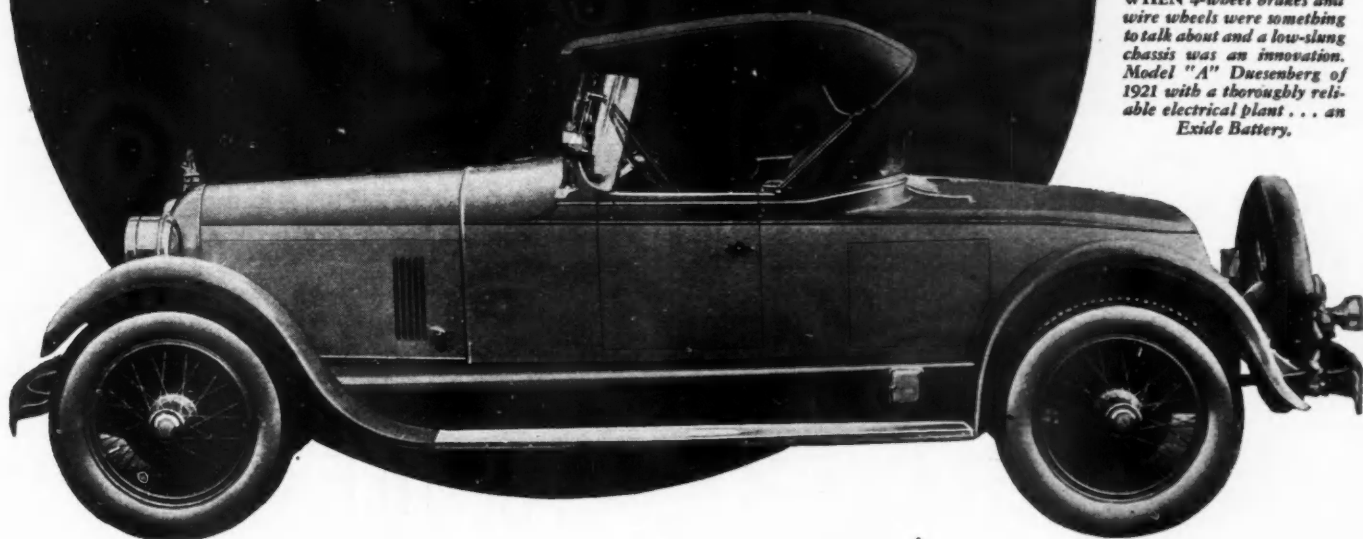
- (1) Training their salesmen,
- (2) Managing their office, effecting a complete revision of their office records and the installation of a cost system,
- (3) Preparing security issues for the market and following the fortunes of the companies,
- (4) Assisting in programs of expansion and reorganization, etc.,
- (5) Contacting large industrial companies and advising with them on financial matters.

He was born in the Middle West and was graduated from an eastern university. He enjoys excellent health. Twenty-five years of experience have developed a spirit of cooperation and seasoned a judgment which is frequently sought. He is diplomatic but forceful. Opportunity for discussion is invited.

Address Box 848, care of Automotive Industries.

"A 1921 MODEL? —Impossible!"

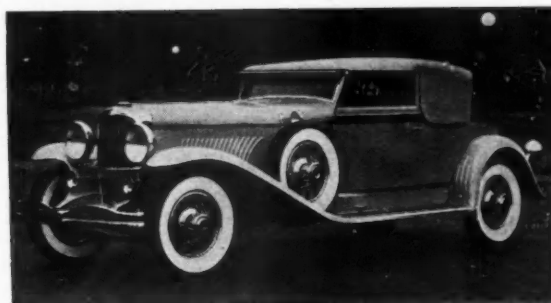
WHEN 4-wheel brakes and wire wheels were something to talk about and a low-slung chassis was an innovation. Model "A" Duesenberg of 1921 with a thoroughly reliable electrical plant . . . an Exide Battery.



THIS 1921 roadster was the first commercial passenger car built by Duesenberg. It is hard to believe that a snappy "job" like this was put out 11 years ago. Its low, racy lines were far in advance of that year. So was its equipment. Nothing but the best was used. An Exide Battery took care of its electrical needs.

Ever since batteries were first used in automobiles, Exide has built the finest. Now, as then, fine cars carry Exides. Today the battery has more jobs than it had in 1921. But you can depend on an Exide to do them, with dispatch and economy.

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STILL A LEADER—The Duesenberg Convertible Victoria of 1932 . . . still Exide-equipped.

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Exide Batteries of Canada, Limited, Toronto

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DROP FORGE CO. LANSING MICH.

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 Heavy, medium and light stampings in any quantity. A steady flow of production—when you want it.
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 Worcester, Mass.

 QUALITY STAMPINGS

BUYERS' GUIDE

Automotive Products and Factory Equipment Manufactured by Advertisers in This Issue

See Alphabetical List of Advertisers on Pages 50 and 51

This Advertiser's Index is published as a convenience, and not as part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

Arms & Knuckles, Steering Atlas Drop Forge Co.	Boring Machines Baker Bros., Inc. Foote-Burt Co.	Camshafts Atlas Drop Forge Co. Gunite Foundries Corp. Park Drop Forge Co.	Compounds, Cutting Grinding & Stamping Oakite Products, Inc.	Drilling Machines Baker Bros., Inc. Foote-Burt Co.
Axles Atlas Drop Forge Co. Park Drop Forge Co.	Brake Bands Königsloew Mfg. Co., Otto	Castings <i>Die</i> Paragon Die Casting Co. <i>Gray Iron</i> Gunite Foundries Corp. Pittsburgh Lectromelt Furnace Corp.	Compressors, Air Bendix Westinghouse Automotive Air Brake Co.	Enamels American Chemical Paint Co. (Rust Proofing)
Batteries, Storage Electric Storage Battery Co.	Brake Drums Gunite Foundries Corp. Motor Wheel Corp.	Chains <i>"ront End</i> Morse Chain Co.	Connecting Rods Atlas Drop Forge Co. Park Drop Forge Co.	Felt American Felt Co.
Bearings, Anti-Friction <i>Ball</i> Federal Bearings Co., Inc.	Brakes <i>Air</i> Bendix Westinghouse Automotive Air Brake Co. <i>Hydraulic</i> Hydraulic Brake Co.	Channels for Glass <i>Felt</i> American Felt Co.	Crankshafts Atlas Drop Forge Co. Park Drop Forge Co.	Fenders Motors Metal Corp.
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Blanks <i>Forged</i> Atlas Drop Forge Co. <i>Stamped</i> Königsloew Mfg. Co., Otto	Cable <i>Brake or Cutout Control</i> American Steel & Wire Co. <i>Wickwire</i> Spencer Steel Co. <i>Ignition, Starting and Lighting</i> American Steel & Wire Co.	Cleaners <i>Building Maintenance</i> Oakite Products, Inc. <i>Metal</i> American Chemical Paint Co. (Rust Preventives) Ford Co., J. B. Oakite Products, Inc.	Cutters Baker Brothers, Inc. (Keyseating) Fellows Gear Shaper Co. (Gear)	Forgings Atlas Drop Forge Co. Park Drop Forge Co.
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			Dies, Jigs and Fixtures Marquette Tool & Mfg. Co.	Melting Pittsburgh Lectromelt Furnace Corp.
			Disks, Clutch Curtis Clutch Disc Co.	Gages, Inspection Pratt & Whitney Co. (Turn to page 48, please)

Lowers maintenance cleaning costs!

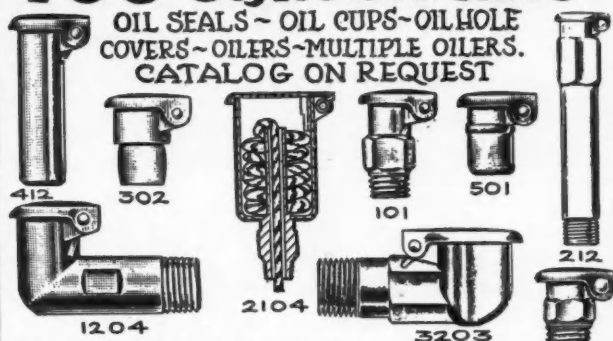
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Industrial Cleaning Materials and Methods

700 Styles and Sizes

OIL SEALS ~ OIL CUPS ~ OIL HOLE
COVERS ~ OILERS ~ MULTIPLE OILERS.
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SAVING IN FUEL
WITH
Steam Cooling
Rushmore Laboratory
PLAINFIELD • NEW JERSEY

PJ FOR OVER **PJ**
A QUARTER OF
A CENTURY
THE PIONEER
MANUFACTURER OF
AUTOMATIC CHUCKING
EQUIPMENT

POTTER & JOHNSTON MACH. CO.
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highest esteem
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COILED and FLAT SPRINGS

PHOSPHOR BRONZE SPRINGS A SPECIALTY

SMALL STAMPINGS

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WIRE SHAPES

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Presses, dies, shears, double seamers, trimmers and special machinery. Also automatic can making machinery and rolling mill equipment.

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POWER PRESS
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AIR CUSHIONS
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and drawing problems. Usually they can help.
Also, write for booklet, "Better Stamping."
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GUNITE

(Cast) BRAKE DRUMS



GUNITE FOUNDRIES CORP., ROCKFORD, ILLINOIS



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Grease packed anti-friction bearing over-
comes wear.
The lubricant is effectively retained.
Dirt, grit and water are completely ex-
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DILECTO Insulating sheets, rods, tubes and special shapes.
Also CELORON Timing Gears and Diamond Vulcanized Fibre.
CONTINENTAL-DIAMOND FIBRE CO.
Newark, Delaware

BUYERS' GUIDE—Continued

(Continued from page 46)

Gaskets

Felt
American Felt Co.

Gear Cutting Machines

Fellows Gear Shaper
Co. (Shapers)

Gear Material

Non-Metallic
Continental-Diamond
Fibre Co.

Gears

Timing, Metallic
Park Drop Forge Co.
Timing, Non-Metallic
Continental-Diamond
Fibre Co.

Grinding Machines

Fellows Gear Shaper
Co.
Foote-Burt Co.
Heald Machine Co.
Internal
Heald Machine Co.
Surface
Heald Machine Co.
Valve Seat
Foote-Burt Co.

Hammers, Power

Chambersburg Engi-
neering Co.
Chambersburg National
Co.
National Machinery Co.

Heat Treating

Barnes-Gibson-Ray-
mond, Inc.
Barnes, Wallace Co.
Gibson, Wm. D., Co.

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Motors Metal Corp.

Hose, Flexible Metallic

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Gunite Foundries Corp.

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(Reyzel Lacquer Con-
stituent)

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Potter & Johnston Ma-
chine Co.

Engine

Pratt & Whitney Co.

Turret

Potter & Johnston Ma-
chine Co.

Lubricators, Chassis

Gits Bros. Mfg. Co.

Lugs

Wolverine Tube Co.

Machine Work

Konigslow Mfg Co.,
Otto (General)

Methods, Cleaning

Oakite Products, Inc.

Molded or Machined Parts

(Phenolic)
Continental-Diamond
Fibre Co.

Pads

Felt
American Felt Co.

Paints

American Chemical
Paint Co. (Heat Re-
sisting)

Pickling Compounds

American Chemical
Paint Co.

Plates, Clutch Pressure

Gunite Foundries Corp.

Plating Equipment & Supplies

Oakite Products, Inc.

Plugs, Expansion

Hubbard Spring Co.,
M. D.

Presses

Bliss Co., E. W.
Chambersburg Engi-
neering Co.
Chambersburg National
Co.
Cleveland Punch &
Shear Works Co.
Marquette Tool & Mfg.
Co.
National Machinery Co.

Punches

Cleveland Punch &
Shear Works Co.

Radiator Shells

Motors Metal Corp.

Removers, Enamel and Paint

American Chemical
Paint Co.
Oakite Products, Inc.

Rolling Mills

Bliss Co., E. W.

Running Boards

Metal
Motors Metal Corp.

Rust Removers & Pre-ventives

American Chemical
Paint Co.
Oakite Products, Inc.

Screw Machine Products

Barnes, Wallace Co.

Screw Machines

Cleveland Automatic
Machine Co.
Potter & Johnston Ma-
chine Co.

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Pittsburgh Steel Co.

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Bliss Co., E. W.
Cleveland Punch &
Shear Works Co.

Sheet Metal Machines

Bliss Co., E. W.
Cleveland Punch &
Shear Works Co.

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John Warren Watson
Co.

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Pratt & Whitney Co.

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Baker Bros., Inc.
Bliss Co., E. W.
Cleveland Automatic
Machine Co.
Pratt & Whitney Co.

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PITTSBURGH LECTROMELT FURNACE CORP.
Pittsburgh, Pa.

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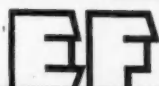
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AUTOMOTIVE INDUSTRIES is read each week by general executives, production men, engineers, purchasing agents and others whose o.k. means orders for those who sell to The World's Largest Manufacturing Industry.

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CLEVELAND, OHIO



ELECTRIC AND FUEL
FIRED FURNACES

AND MATERIAL
HANDLING EQUIPMENT

LOWER COSTS

The
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CLEVELAND POWER PRESSES

THE CLEVELAND PUNCH & SHEAR WORKS COMPANY
CLEVELAND, OHIO

ENDORSED!

... adopted as Standard
Equipment by 10 CAR
MANUFACTURERS ...

CENTRIFUSE
Brake Drums

A PRODUCT OF

MOTOR WHEEL CORPORATION, Lansing, Mich.

BUYERS' GUIDE—Continued

Springs

*Extension, Compression,
Torsion or Flat*

American Steel & Wire
Co.
Barnes-Gibson-Ray-
mond, Inc.
Barnes, Wallace Co.
Cook Spring Div.
Gibson, Wm. D., Co.
Hubbard Spring Co.,
M. D.
Mather Spring Co.
Raymond Mfg. Co.
Wickwire Spencer Steel
Co.

Leaf

Mather Spring Co.

Valve

American Steel & Wire
Co.

Stampings or Drawings, Metal

Barnes-Gibson-Ray-
mond, Inc.
Barnes, Wallace Co.
Cook Spring Div.
Gibson, Wm. D., Co.
Hubbard Spring Co.,
M. D.
Konigslow Mfg. Co.,
Otto
Motor Wheel Corp.
Motors Metal Corp.
Raymond Mfg. Co.
Wickwire Spencer Steel
Co.
Worcester Stamped
Metal Co.

Steam Cooling

Rushmore Laboratory

Steel

Alloy

Carpenter Steel Co.
Illinois Steel Co.
Republic Steel Corp.

Bars

Carpenter Steel Co.
Illinois Steel Co.
Republic Steel Corp.

Billets

Carpenter Steel Co.
Illinois Steel Co.

Carbon

Carpenter Steel Co.
Illinois Steel Co.
Republic Steel Corp.
Wickwire Spencer Steel
Co.

Cold Drawn

American Steel & Wire
Co.
Carpenter Steel Co.
Republic Steel Corp.
Wickwire Spencer Steel
Co.

Electric Furnace

Carpenter Steel Co.
Illinois Steel Co.

High Speed

Carpenter Steel Co.

Shapes

Illinois Steel Co.
Wickwire Spencer Steel
Co.

Spring

Barnes-Gibson-Ray-
mond, Inc.
Barnes, Wallace Co.
Gibson, Wm. D., Co.

Stainless

Carpenter Steel Co.
Illinois Steel Co.
Republic Steel Corp.
Wickwire Spencer Steel
Co.

Strip

American Steel & Wire
Co.
Carpenter Steel Co.
Illinois Steel Co.
Republic Steel Corp.
Wickwire Spencer Steel
Co.

Tool

Carpenter Steel Co.

Steering Gears

Ross Gear & Tool Co.
Tank Support Straps
Konigslow Mfg. Co.,
Otto

Tapping Machines

Baker Brothers, Inc.

Thread Generators

Fellows Gear Shaper
Co.

Tubes, Axle, Steering Column & Torque

Ohio Seamless Tube Co.
Pittsburgh Steel Co.

Tubing

Aluminum

Wolverine Tube Co.

Brass & Copper

Wolverine Tube Co.

Flexible Metal

Titeflex Metal Hose Co.

Seamless

Ohio Seamless Tube Co.

Steel

Ohio Seamless Tube Co.
Pittsburgh Steel Co.

Tubular Products

Ohio Seamless Tube Co.

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Potter & Johnston Ma-
chine Co.

Universal Joints

New England Auto
Products Corp.

Washers

Felt

American Felt Co.

Lock

Shakeproof Lock Wash-
er Mfg. Co.

Plain Metal

Hubbard Spring Co.,
M. D.
Konigslow Mfg. Co.,
Otto

Welding Material

American Steel & Wire
Co. (Wires and Elec-
trodes)
Wickwire Spencer Steel
Co. (Wires)

Wheels

Motor Wheel Corp.

Wicks, Felt

American Felt Co.

Wire


Flat, Round, Square or
Special Shape
Barnes, Wallace Co.

Spring

American Steel & Wire
Co.
Barnes, Wallace Co.
Republic Steel Corp.
Wickwire Spencer Steel
Co.

Wrenches

Gunite Foundries Corp.



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Only long experience in the manufacture of Clutch Discs can tell a manufacturer what is necessary for satisfactory performance in automobile, truck or tractor service.

This company has concentrated its efforts for years on the manufacture of custom-built Clutch Discs of precision. The result of that skilled experience shows in the perfection of its finished product.

And because of solving so many perplexing problems in this field, the Curtis Company is particularly qualified to give expert advice as to your particular needs. Correspondence is invited.

CURTIS CLUTCH DISC CO.
Division of Curtis
Manufacturing Company
1917 Kienlen Ave.
St. Louis, Mo.

CURTIS Clutch Discs are furnished in high carbon, alloy or mild steel, also non-ferrous metals, plain or slotted, flat or formed, unfinished or ground, and polished, tempered or untempered, any size.

Economical Metal Cleaning

There is only one way to economically clean metals—that is to use a metal cleaner which is especially fitted to do the job you want done. That is why there is a large family of Wyandotte Metal Cleaners, each made to do a certain kind of metal cleaning superlatively well.

Among the group of Wyandotte Metal Cleaners there is one which will save you money—by turning out better work, with fewer rejects, in quicker time.

A letter will bring a Wyandotte Service Man to work out your cleaning problem in your own plant. His services place you under no obligation.



Write for
detailed information

Wyandotte

Clean "Chemically" Clean
Metal Cleaners

The J. B. Ford Co. Wyandotte
Michigan

Index to Advertisers

The Advertisers' Index is published as a convenience, and not as a part of the Advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

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JUN 27 1932

AUTOMOTIVE INDUSTRIES

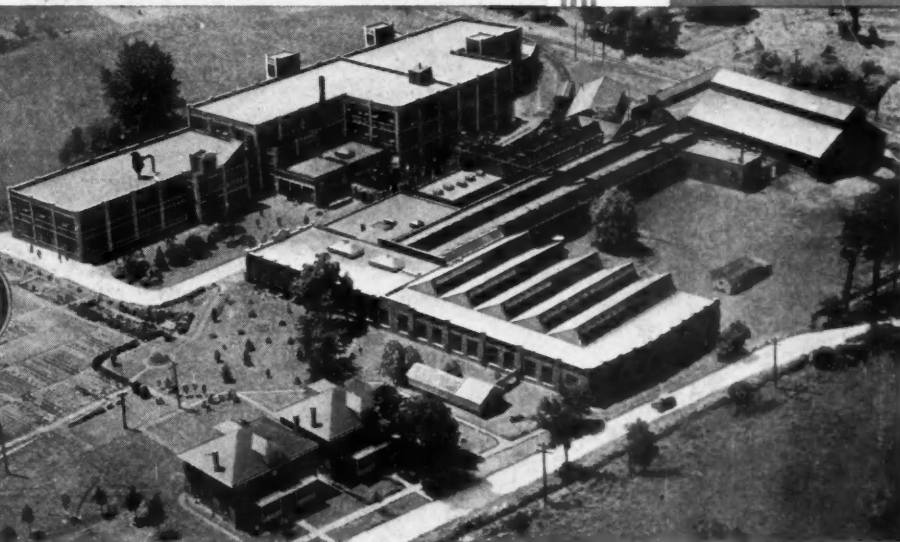
LAND AIR WATER

Volume 66
Number 26

PUBLISHED WEEKLY AT CHESTNUT AND 56TH STREETS
PHILADELPHIA, JUNE 25, 1932

\$1.00 a year
25c a copy

FEDERAL BEARINGS

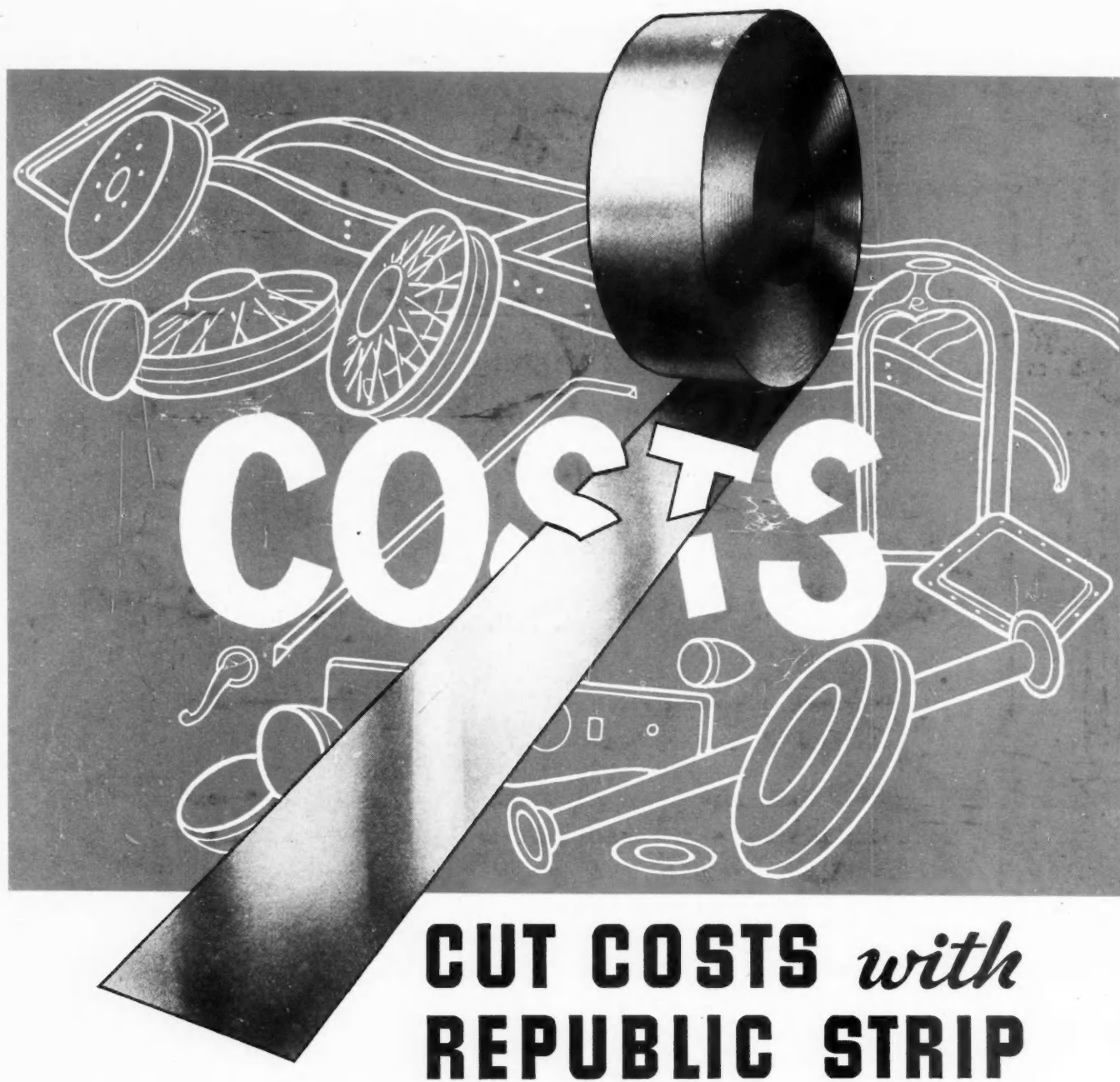


THE FINEST BALL BEARINGS ARE MADE IN THIS GREAT PLANT

QUALITY in materials and precision in manufacture . . . these are the characteristics which distinguish FEDERAL BALL BEARINGS. The interlocking ball retainer is an exclusive feature which adds much to the efficiency of "Federals". For many years, the manufacturers of America's leading cars have selected these bearings because of splendid performance.

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The **FEDERAL BEARINGS CO. Inc.**
POUGHKEEPSIE, N.Y.



CUT COSTS *with* **REPUBLIC STRIP**

Low cost cars are the result of careful planning. Low cost parts are often the result of using Republic strip steel.

Faster production, lower labor costs, lower waste material costs, higher percentage of acceptable parts—all are the result of using strip where other materials were formerly used. Thousands of automotive items are now being made from it—better and more economically, including frames, wheels,

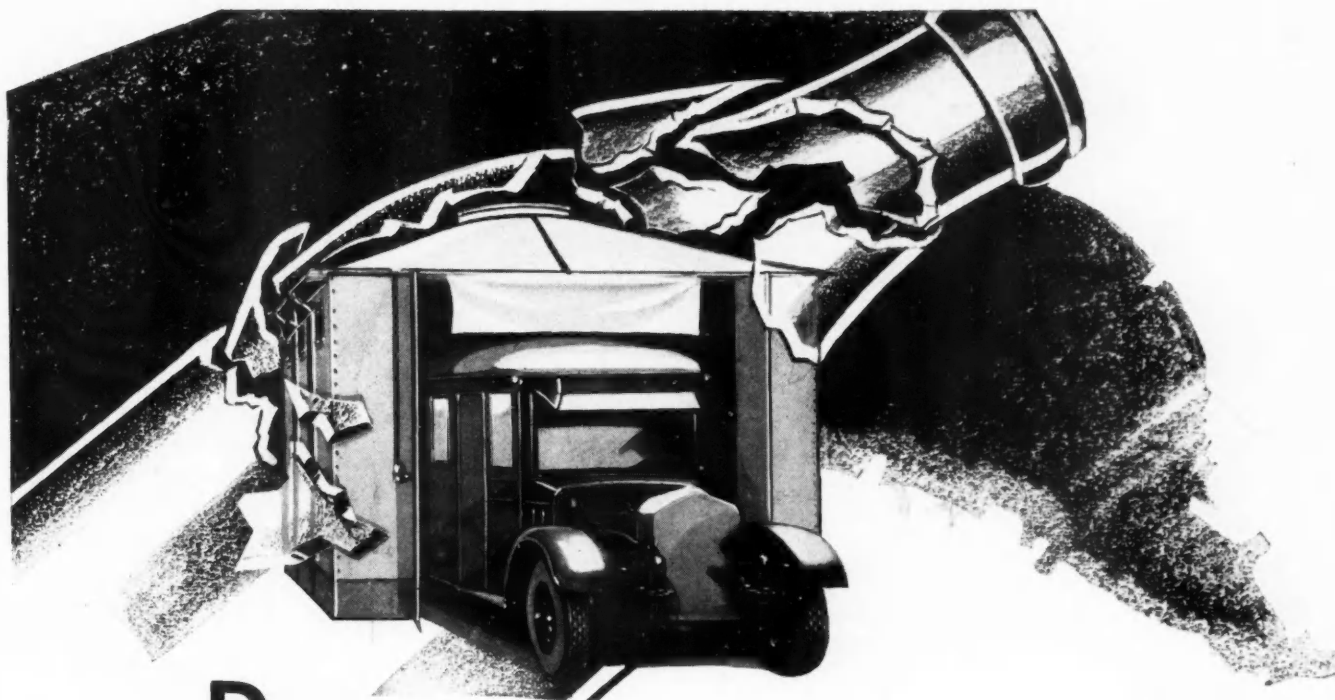
radiator casings, brake drums, axle housings, running boards, instrument panels, tire covers, hardware and trim.

Republic strip is uniform in structure and true to gauge and width.

It is made in a wide variety of materials and finishes. Our engineers, working with your engineers, will be glad to offer suggestions on how to cut costs with Republic strip, and at the same time improve quality.

REPUBLIC STEEL CORPORATION

GENERAL OFFICES  YOUNGSTOWN, OHIO



Break the bottle neck at the oven... Rezyl-type finishes bake completely in 1 hour at 200° F.

Drying to a hard, elastic film in one hour, Rezyl-type finishes save production time. With this short bake period at a fuel-saving temperature, adhesion is excellent. A durable high-gloss finish is obtained. Color retention is phenomenal.

The impressive results with Rezyl-type finishes are due to the outstanding properties of these synthetic resins of the polybasic acid group. Opaque to destructive ultra-violet light, Rezyls impart this desirable characteristic to finishes in which they are used. Long exposure to sunlight does not noticeably break down the film.

In service, Rezyl-type finishes are more durable than any comparable finish.

Rezyls are particularly adapted to the production of metal primers for air drying or baking. They can be incorporated into surfacers allowing application of several coats in rapid succession. Surfacers formulated with Rezyls sand easily and hold out succeeding coats without lifting.

FREE—An Important Booklet

It contains test data and basic formulas on Rezyls. When writing, please state the name of your supplier.

For Motor Coach, Motor Truck and Passenger Car primers, surfacers and finish coats, Rezyls 110-1102 and 113 are particularly well adapted. Our Technical Department stands ready to consult on special problems. If desired a representative will visit your plant to assist during the preparation of trial batches



Industrial Chemicals Division

American Cyanamid Company

535 Fifth Avenue New York

The
rear seat
becomes as good
as the front!



The use of softer front springs, long recognized by Engineers as the outstanding need to iron out the roughness of the rear seat ride, has finally been made possible.

A car acts exactly like a teeter-board—snappy up and down movements caused by stiff front springs are felt equally by the radiator and by the rear seat passenger—the front seat passenger is at the middle of the board and is not disturbed.

Softer front springs completely change these movements—instead

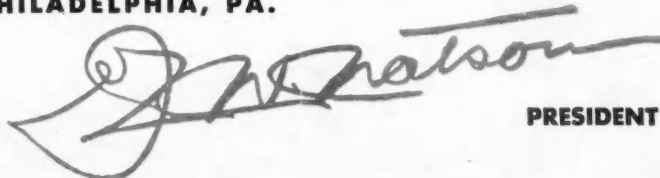


of being snappy they become slow and lazy—the rear seat passenger then, instead of being thudded and jerked over the roads, floats along in easy, unabrupt undulations. The rear seat becomes as good as the front!

The spectacular and infallible gyroscopic control resistance provided by the coming Watson Double-Acting GYRO Stabilators makes possible, with certainty and with safety, the standard use of softer front springs than have heretofore been attempted even experimentally.

GYRO

JOHN WARREN WATSON COMPANY
PHILADELPHIA, PA.


PRESIDENT

